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VOL LXIII 16 SEPTEMBER 1950 No 1627

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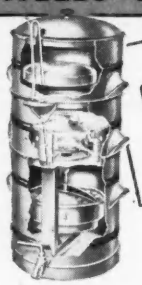

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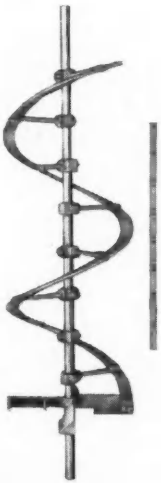

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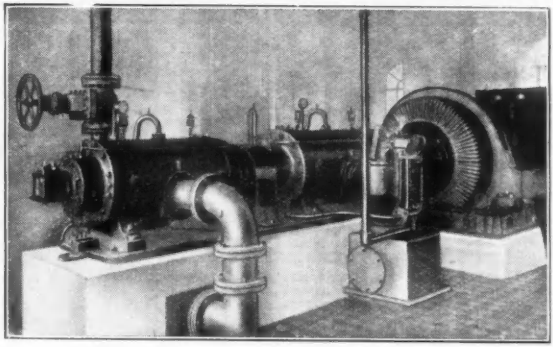

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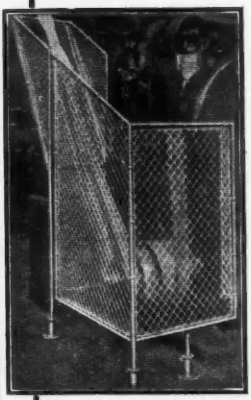

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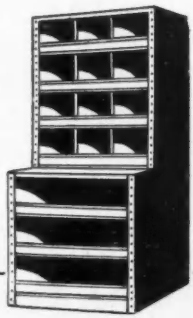

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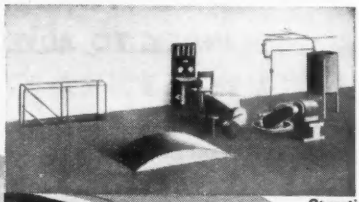

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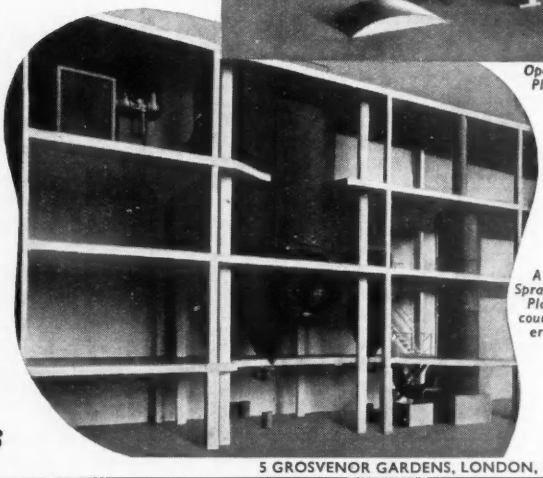

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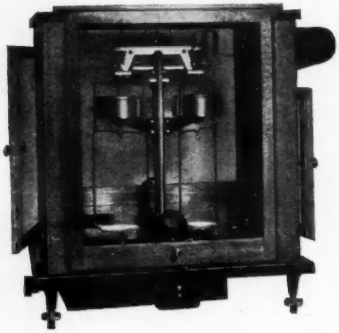

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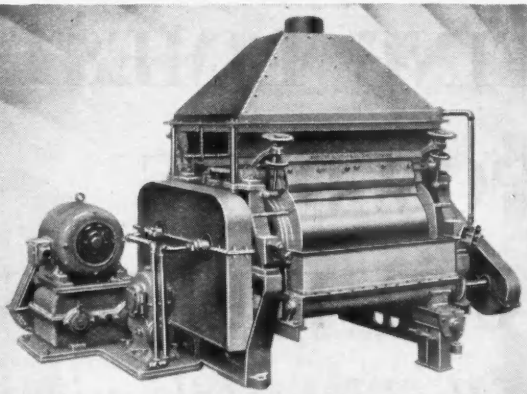

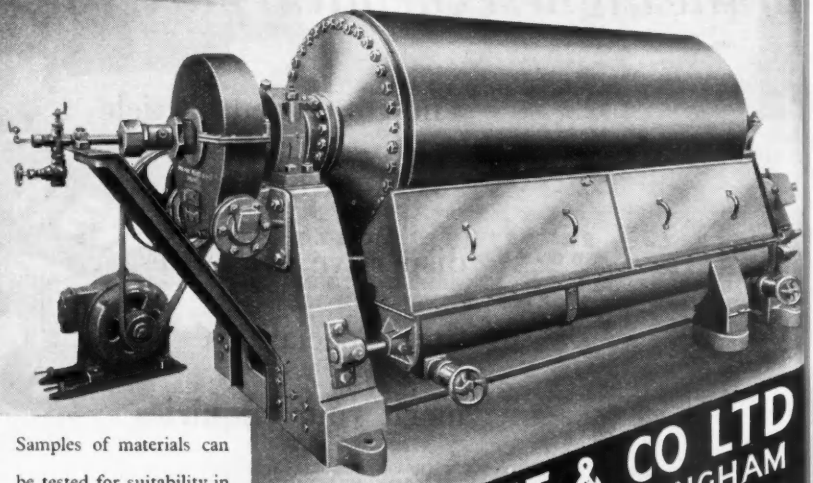

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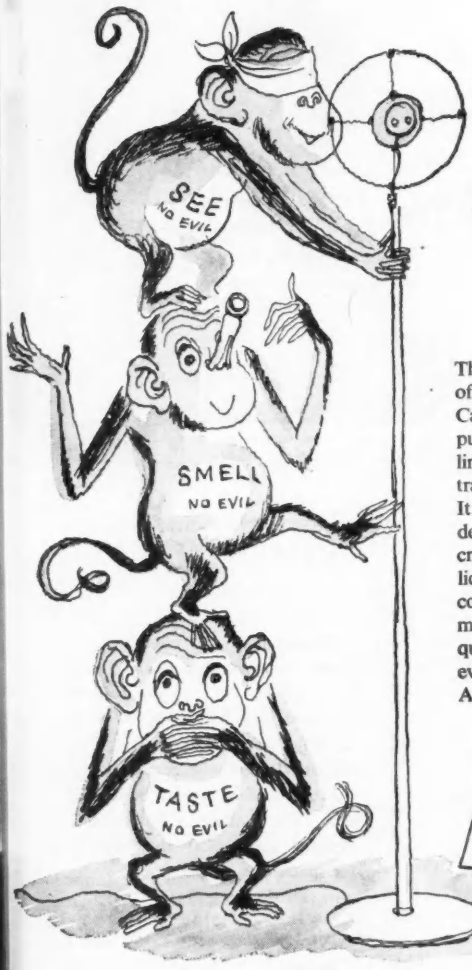

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Volume LXIII 16 September 1950 Number 1627

The New Antibiotic

THE high hopes and wide publicity evoked by the belated announcement of the isolation of streptomycin, which was in fact achieved more than six years ago, would have much more justification in some facts disclosed in a current report by the principal group concerned in the sixty-year-old study of the actinomycetes. That is the production of neomycin, of which the significant new potentialities have been described in Paris this week before the first international Congress of Internal Medicine* by Dr. Selman Waksman, who first isolated streptomycin (in the department of microbiology at Rutgers University, U.S.A., in 1943).

The importance of this discovery lies in the fact that neomycin is reliably credited with having repaired some of the most serious defects of streptomycin, the existence of which, however, has not been able to outweigh the social and economic value of the earlier antibiotic. Streptomycin now supports a large and growing specialist industry here and one infinitely larger in the U.S.A., where precedence in development permitted exports to begin in 1948.

The most disconcerting fact about streptomycin, which caused medical men and health authorities to restrict its use, has been its liability to stimulate the evolution of resistant strains of the *microbacterium tuberculosis*. Nevertheless its overall effect as an inhibitor justified the belief that it offered in some cases the best hope available of recovery from some of the most destructive forms of the disease. The other recognised disadvantage of streptomycin therapy was the production of toxic effects, particularly of neurotoxic symptoms of varying gravity. The production of dihydrostreptomycin during 1948, by the catalytic hydrogenation of streptomycin, reduced by about half the seriousness of that factor.

In all these aspects and some others equally important neomycin is reported by Dr. Waksman to have gone far towards removing the objections to the more widespread use of this family of antibiotics. In assessing these new characteristics it has to be borne in mind, however, that these are laboratory results. What is observed *in vitro* or in the treatment of laboratory animals has often been shown to have been very different from the response when the same substance is introduced into the complex human organism. With those reservations, which Dr. Waksman does not fail to

* The paper is dealt with at length in the *British Medical Journal* 4679, 595-600.

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make, the importance of the new possibilities appears to indicate the achievement of a decisive advance. The justification of that conclusion is supplied by Dr. Waksman's own brief summary of the facts. He says:—

1. Neomycin is more active than streptomycin against both the saprophytic *Mycobacterium* 607 and the human and animal pathogenic strains of *M. tuberculosis*.

2. Neomycin is as active against the streptomycin-resistant strains of the above organisms as against the sensitive ones.

3. Neomycin favours to a far less degree than does streptomycin the development of resistant strains of mycobacteria; it is true that on prolonged serial transfer of large numbers of cells a considerable increase in resistance may be obtained, but the rate of increase is much slower than in the case of streptomycin.

4. Neomycin is characterised by a relatively low toxicity in animals and has a high therapeutic index.

The results recently published by Karlson, Gainer, and Feldman (1950) brought out the fact that neomycin is capable of producing a reversal of progressive tuberculosis in experimental animals. It is also effective against experimental infections due to streptomycin-resistant tubercle bacilli. A number of clinical cases, representing different forms of tuberculosis, are now being treated with neomycin, and it is expected that before very long a clear picture may be obtained of the potential place that this antibiotic may find in the treatment of tuberculosis. The possibility of combined action of neomycin and streptomycin or another antimicrobial agent is also receiving much consideration.

Some of the experimental results reported from the U.S.A. suggest that Dr. Waksman has certainly not overstated the merits of the new antibiotic. A comparison has been made of the amounts of neomycin and of streptomycin required to inhibit growth of different mycobacteria in laboratory tests. To secure inhibition of growth of *M. tuberculosis* in a liquid medium required 1-5 microgram of streptomycin and only 0.5 unit of neomycin. The most striking results were expectedly associated with the streptomycin-resistant infections (*M. tuberculosis* H37RvR and *mycobacterium* 607R). In these the ratios of effectiveness of neomycin and streptomycin were differentiated by factors of several thousands. Such evidence, added to the claim that the new antibiotic is active against both common forms of mycobacterium, even after they have acquired immunity during unsuccessful treatment with streptomycin, encourages the hope that chemotherapy has acquired for the campaign against tuberculosis a second weapon more effective than any it has yet employed.

The Paris report unfortunately

(*continued on page* 386)

Notes and Comments

Fair Dealer

AN exasperating defect of much that is written or spoken about the need for fair dealing between industries and employees is the inability to take an impartial view. One of the best indications that it is possible to portray without prejudice the present relationship between employers and employed of all categories comes from Dr. W. H. Garrett (Monsanto Chemicals, Ltd.) in a monograph of a novel and distinctive kind, "The Human Side of Industry." He surveys more directly than have any recent commentators the true duties and objectives of managements and the common causes of friction and distrust in "industrial relations." He does not hesitate in castigating the short-sighted policies on both sides from which most contemporary troubles have sprung. Dr. Garrett's distinguished record in conciliation, as chairman of the Joint Industrial Council of Chemical Industry and member of the Association of Chemical and Allied Employers and of national arbitration tribunals, lends weight to his conclusions and his advice on measures which could dissipate old antagonisms and avert some incipient ones. Of topical importance in that connection are his remarks on the comparative neglect of the "white collar worker," which describes large numbers of chemists as well as supervisory staffs, whose prospects certainly are not improved by the "victories" of organised labour. The solution to the impending problem there is implicit in his summing up: "A trade union has no useful function for a group of employees who are adequately rewarded for their effort. The choice before management is clear. . . ."

Science Forum

THE announcement that Downe House, Orpington, Kent, may become a residential centre where practically all may receive short courses and so gain a more confident understanding of the scientific method and of some current objectives of the sciences will afford much satisfaction to those who have preached the need to broaden the basis of this phase of public information services. This would not be yet another school for specialists. It would serve, for a change, the many who probably have no scientific qualifications or academic distinction, but who share the scientist's taste for facts rather than fairy tales. The proposal is unique in its purpose of bringing together under one roof students and teachers, technicians and artisans, writers and the rest on terms which will not put the uninitiated at any great disadvantage or waste the time of the expert auditor. Few specialists would grudge an occasional visit to learn something of what is being attempted in other fields. This original conception is still, unfortunately, not much more than the seed from which it is hoped the crystal will grow. The speed of that process will depend upon the activity of the British Association, Kent County Council and Oxford University, which sponsored the idea. It will have a host of unnamed supporters because it will apparently have nothing to do with administering sugar-coated doses of ill-balanced information and will give responsible guidance of public opinion at a critical juncture in scientists' affairs.

Finding the Answer

ANOTHER information service, in this instance principally for industries, is foreshadowed in an original expansion of the liaison services which the Department of Scientific and Industrial Research has just initiated. Making profitable use of the "brains trust" and "quiz" methods, DSIR Intelligence has launched in the form of a bulletin, "Unanswered Questions," an attempt to uncover the answers to specific scientific and technical questions "when normal sources of information have apparently failed." The great merit of this somewhat daring

sop to the widespread thirst for specialised information is its intention to glean information from its supporters as well as to provide it. Since success in providing the right answer consists almost entirely in knowing where to look for it, this broadside procedure should have good results. The first bulletin presents fourteen questions selected from the responses to a preliminary circular—and one answer. Significantly, five of the fourteen are questions more or less intimately related to chemistry.

Subdividing the Sciences

THE recent formation of yet another scientific group—in this instance a medical one as its suggestive title, the Bone and Tooth Society, indicates—is one of many reminders of the unending multiplication and subdivision of the departments of science. Scarcely any quarter of the year passes unmarked by the emergence of a new organisation focusing its attention on one or other sector of the front of scientific advance. The effect of all these new specialist subdivisions is to heighten the boundary walls of specialisation and diminish a little more the traditional functions of the major societies. The multiplication of specialist groups might be deplored but for one circumstance—they are all needed. The " all round " scientist of 30 or 40 years ago as a species is extinct and the spacious " back rooms " he inhabited have been subdivided and reallocated as thoroughly as has the Victorian mansion.

Parent Societies

A GOOD deal of attention since the war has been given to purging scientific education of specialised tendencies. Societies and individuals have called for broader and more fundamental training and there are signs that the universities and other centres are delaying the impact of specialisation upon students until the last phases of training. This is all to the good. But the young scientist, when he emerges, finds himself confronted with innumerable units of discussion and publication and is obliged to enter into the specialised outlook. Each important industry is tending to create its own technical society and forum. The whole situation cannot have escaped the attention of the principal organisations. They alone can hold the many sections together and stimulate lateral lines of communication between the increasingly numerous subdivisions. It must be ensured that the addition of more branches year by year does not cause an equivalent subtraction of interest in the meetings and publications of the parent societies.

Rearmament Programme

THE summing up by the Prime Minister to Parliament this week of the effects in industry of the urgent rearmament proposals did not add much to what any intelligent speculation must have indicated. He did not specify what " some new demand on chemical industry " might represent, although his reference to it in the context of the textile and building industries did not suggest the degree of urgent priority which an arms programme is capable of demanding. The conclusion that no precise plan for specialised chemical production has been formulated seems justified. The other reliable indications concern likely diversions and reallocations of export products and possibly some redistribution of workers.

THE NEW ANTIBIOTIC

(*continued from page* 384)

throws little light on the laboratory methods by which neomycin was produced or upon its suitability for large-scale manufacture. It serves, however, if incidentally, to present the new antibiotic in its proper perspective, as one more heartening stage in the investigation whose inception is discernible in Gasperini's proofs in 1890 of the antibacterial action of streptothrix. Neomycin is treated by Dr. Waksman as a beginning rather than an end. " Sooner or later," he says, " other antibiotics will be found which are more effective than either (streptomycin or neomycin) and less toxic . . . Finding these is merely a matter of further research."

BRITISH ENTERPRISE IN U.S.A.

New Trade Promotion Centre

DETERMINATION to do everything in its power to close this country's "dollar gap" through the methods of private enterprise finds new evidence in the opening on September 7 of the British Trade Promotion Centre, at Fifth Avenue (at 53rd Street), New York City.

It has been made possible entirely by the initiative and support of trade organisations and private firms.

The centre is being organised and managed by the British Commonwealth Chamber of Commerce in the United States, and organisations in the U.K. which have already signified their intention of participating in it are the Dollar Exports Board, the Federation of British Industries, the National Union of Manufacturers, the Scottish Council (Development and Industry) and BETRO. The centre's main functions are to provide information, advice and help to British industrial organisations and individual firms on any and every aspect of exporting British goods to the U.S.A., and to represent the views of British industry, as occasion requires, to the American authorities and American business men.

An important feature of the services of the centre is the provision of offices available for letting on a day-to-day basis to visiting British business men, together with secretarial help if required.

Private enterprise in entering the American market found additional expression at the National Chemical Exposition at the Chicago Coliseum, staged from September 5 to 9 by the Chicago section of the American Chemical Society. Among the exhibits there was a display of the products of the Watford Chemical Co., Ltd., including synthetic caffein and theophylline, new emulsifiers and thickeners for the pharmaceutical industry; new stabilisers and antioxidants for cosmetics; a synthetic drying oil for paint manufacture; a high grade of glyceryl monostearate for use in the ice cream and margarine industries; and a new range of oil additives for lubricating oils. This is stated to be the first time Britain has entered the U.S. market with substantial exports of specialised oil additives.

The I.C.I., Ltd., stand at the recent International Fair at Chicago represented a highly individual representation of a wide sector of British chemical production

U.S. Simplifies Sulphuric Acid Plant

BY eliminating seven major items of equipment, a new process developed by the Chemical Construction Corporation, New York City, is claimed to reduce greatly the cost of producing sulphuric acid. The new design is said to be much simpler than the conventional contact process and to save as much as 20 per cent of the present capital cost of erecting a medium-size sulphuric acid plant in the U.S.A. The first commercial-size installation using the simplified layout, from which major items of equipment have been eliminated, went into operation recently at American Cyanamid Company's works at Hamilton, Ohio.

Traditional components used in conventional contact process sulphuric acid plants which are no longer needed with the new design include the gas filter, the heat exchanger, the sulphur trioxide cooler, the acid coolers, the acid circulating and transfer pumps, and the diluting equipment.

£10 M. LOAN FOR DISTILLERS

Developing the Industrial Side

THE third large addition to the funds employed by chemical organisations in Great Britain is announced by The Distillers Company, Ltd., which has obtained Treasury consent to borrow £10 million, by the private placing with "certain corporate investors" of unsecured loan stock. The new money is required to finance expansion of the company's potable spirits undertakings and for the further development of the industrial side of the group's business, of which British Industrial Solvents is prominent.

The money is to be raised in two portions, of which the first will be £4 million in a 3½ per cent stock at par, which will be be repaid in equal annual instalments of £1 million, starting in 1952 and ending in 1955. The second portion of £6 million will be derived from the issue of 3 15/16 per cent stock at par, repayable by four annual instalments of £1 million, starting in 1956, and a final payment of £2 million in 1960. Repayment is to be made out of profits.

As in the instance of the I.C.I. 4 per cent loan stock (THE CHEMICAL AGE, *63*, 351), there is to be no public issue and no application will be made for Stock Exchange for leave to deal.

Developing Wool Chemistry

ADVANCES in wool chemistry were discussed and new laboratory apparatus was on view at the annual summer conference of the Society of Dyers and Colourists held this week at Leeds University.

Professor J. B. Speakman, in the opening lecture, said that variations in dyeing which produced effects such as bad levelling, skittering, etc., were now attributed to variations in the chemical constitution of the wool fibre.

Changes equivalent to as much as 4 per cent in the molecular constitution of wool between individual fibres in a single wool lock had been recorded. This had stimulated attempts to devise a chemical pretreatment which would overcome a number of the difficulties previously experienced in wool dyeing.

The new apparatus displayed, designed by a member of Leeds University staff, is designed to test the dye absorption of wool under conditions of constant concentration of the dry batch. The concentration is automatically controlled by a photo-electric cell and relay delivering a supply of dye, and so maintaining the concentration at a constant level.

NEW PHOSPHORUS PROJECT

Opposition by Somerset Council

AN adverse report on the suitability of Portishead, Somerset, as a site of a a phosphorus producing plant to be set up at a cost of approximately £1.25 million by Albright and Wilson, Ltd., of Oldbury, has been issued by the Portishead UDC. The council has decided to advise Bristol City Planning Committee and Somerset County Planning Committee of its opposition, on the ground that the factory would injuriously affect the amenities of the Portishead district.

The company is stated to have agreed with the Board of Trade that only phosphorus should be produced at the new plant. If later it was economically impossible to produce phosphorus the firm might have to ask for a change of user to be granted. The firm was also negotiating for a site in another district, at which the ancillary processes would be carried out.

The council conceded that there was no evidence that there were ill-effects on health in the neighbourhood associated with the manufacture of phosphorus alone. If the undertaking were given to restrict manufacture to that, they would not be unduly worried from the health point of view. As far as could be ascertained, there would be no ill-effect from the effluent on persons bathing in the Bristol Channel at Portishead, or as far down as Weston-super-Mare.

The firm had stated that the naked flame observed at one part of the works at Oldbury could be concealed at the new works at Portishead, as could the globes and furnaces. The firm was considering the possibility of pneumatic unloading to overcome the possibility of a dust nuisance arising from the unloading of the phosphate rock at the dock. The further decision on the suitability of the site is in the hands of the Bristol Planning Committee, whose approval would override the decision of the Portishead Council. If the Bristol authority rejected the proposal Albright & Wilson would still be at liberty to seek a public inquiry by the Ministry of Town and Country Planning.

Synthetic Wool

Increasing wool prices have lent an added interest to plans of I.C.I., Ltd., to accelerate the commercial production of Ardil synthetic textile fibre. Work is being speeded up at Dumfries to secure the earliest possible operation. Fuller information on supply prospects should be available in January.

TANNERY CHEMICALS

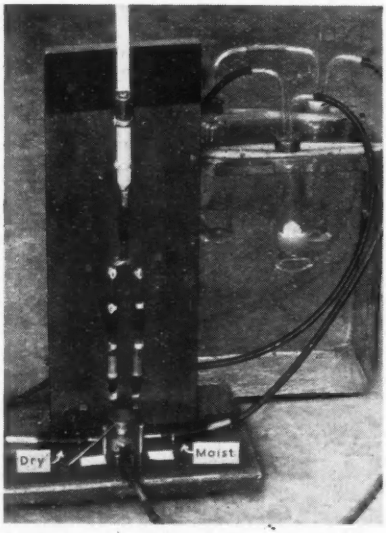
Shoe and Leather Fair Exhibits

SOME 27 firms of producers and importers of tannery chemicals, extracts, adhesives, stains and finishes were among the 400-odd exhibitors at the 41st Shoe and Leather Fair, held at Olympia, London, from Monday to Friday this week.

A tour by THE CHEMICAL AGE of the stands early in the week disclosed evidence confirming the impression generally held that methods of tannage and leather dressing and the materials used have not changed to any notable extent since the war.

Some war-time practices enforced by certain material shortages, have, in fact, been perpetuated.

A notable example is the dispensing to a large extent with chestnut, considerable quantities of which were imported before the war from France and other European countries in both solid and extract form. Tanners have found a satisfactory substitute for this by an adjustment of the mimosa tannage.



A new assembly from the Egham laboratories of the British Leather Manufacturers' Research Association, exhibited at the Shoe and Leather Fair, which illustrates quantitatively the capacity of normal leather (powdered for the purpose) to generate sensible heat when it absorbs moisture

Since the war, the principal tanning materials used have been quebracho, mimosa and myrabolams, and latterly quebracho has receded somewhat from the picture owing to purchasing difficulties in the Argentine.

For some leathers there is a decided tendency to employ synthetic tanning materials in place of the established vegetable extracts, thus perpetuating the war-time trend.

The British Leather Manufacturers' Research Association has played an important part, complementary to the work of certain tanners' own research staffs, in discovering and establishing the war-time substitute tanning materials and methods, some of which have now become everyday practice.

Heat Generated

The Research Association's exhibit included an ingenious piece of apparatus, designed and constructed at its Egham (Surrey) laboratories, for demonstrating and measuring the thermostatic properties of leather. Some of the many other tests undertaken at the association's laboratories were demonstrated.

Among the chemical and associated firms exhibiting were:—

Adhesives and Allied Products, Ltd.; Wm. Aitken & Sons; B. B. Chemical Co., Ltd.; Bowmans Chemicals, Ltd.; British Cellulose Lacquers, Ltd.; Calder & Mersey Extract Co., Ltd.; Cavendish Trading Co. (Chemicals), Ltd.; Earnshaw, Ltd.; Fletcher, Miller, Ltd.; The Forestal Land, Timber and Railways Co., Ltd.; Grant, Wilson & Co., Ltd.; The Hexoran Co., Ltd.; Richard Hodgson & Sons, Ltd.; I.C.I., Ltd. (Leathercloth Division); Keiner & Co., Ltd.; Lankro Chemicals, Ltd.; McVittie, Anderson & Co., Ltd.; Nene Finishes (Northampton), Ltd.; Pancreol, Ltd.; F. H. & H. S. Pochin, Ltd.; Sternol, Ltd.; Tuxcan, Ltd.; Vacuum Oil Co., Ltd.; Vik Supplies, Ltd.; T. Webster & Co., Ltd.; Roy Wilson, Dickson, Ltd.; The Yorkshire Dyeware & Chemical Co., Ltd.

Textile Chemicals

A full range of its chemical products of importance to the textile industry will be featured by Monsanto Chemicals, Ltd., on Stand 16 at the Knitting Machinery and Accessories Exhibition to be held at Granby Hall, Leicester, from October 11 to 21 inclusive.

Increased Production of Some Essential Chemicals

Substantial Changes in June

PRODUCTION in June of basic chemicals in general was higher than in the same month last year. The outstanding increases in output were (in thousands of tons):—sulphuric acid 153.3 (137.4); industrial alcohol (mil. bulk gal.) 2.65 (1.83); superphosphate 19.9 (16.3); and compound fertiliser 170.5 (114.2). Consumption was also greater, notably of superphosphate 19.6 (8.8) and compound fertiliser 180.7 (46.6), while stocks at the end of the period showed an improvement, with the exception of molasses and industrial alcohol.

Among the non-ferrous metals the greatest increase in production concerned lead, of which output was 6.59 thousand tons, compared with 2.78 thousand tons in June, 1949. Despite an increase in consumption of this metal, stocks improved, as did also stocks of zinc concentrates. Copper and zinc stocks were, however, reduced.

Estimated numbers employed in the chemical and allied trades were slightly lower than in May, the total (in thousands) being 445.5, which was 12.7 more than in June last year. Distribution of workers was as follows: coke ovens, chemicals and dyes, explosives, etc., 257.1 (189.5 men, 67.6 women); paints and varnishes 38.8 (27.5 men, 11.3 women); oils, greases, glues, etc., 66.9 (54.0 men, 12.9 women); pharmaceuticals, toilet preparations, etc., 82.7 (43.0 men, 39.7 women).

These facts and the table below are derived from the *Monthly Digest of Statistics*, No. 56.

	June, 1950 Thousand Tons			June, 1949 Thousand Tons		
	Production	Consumption	Stocks	Production	Consumption	Stocks
Sulphuric acid	153.3	—	—	137.4	132.0	—
Sulphur	—	30.5	100.1	—	25.3	94.5
Pyrites	—	17.3	74.9	—	18.1	70.6
Spent oxide	—	14.5	185.3	—	16.3	171.6
Molasses (cane and beat)	11.4	39.4*	181.9	9.8	24.9*	288.0
Industrial alcohol (mil. bulk gal.)	2.65	2.61	0.56	1.83	2.12	4.61
Ammonia	—	7.09†	10.4	—	6.8†	5.69
Superphosphate	19.9	19.6	—	16.3	8.8	—
Compound fertiliser	170.5	180.7	—	114.2	46.6	—
Liming materials	—	521.2	—	—	432.6	—
Nitrogen content of nitrogenous fertilisers	21.74	25.61	—	20.32	13.73	—
Phosphate rock	—	94.8	308.5	—	77.4	206.7
Virgin aluminium	2.46	14.7	—	2.65	13.4	—
Virgin copper	—	29.6	125.2	—	29.4	127.0
Virgin zinc	6.93	20.3	52.7	5.87	13.6	75.4
Refined lead	6.59	14.3	74.1	2.78	9.3	59.6
Tin	2.6‡	3.59	—	2.78	2.07	22.0
Zinc concentrates	—	13.5	68.5	—	13.2	29.2
Magnesium	0.3	0.47	—	0.47	0.41	—
Pig iron	182.0	140.0	515.0	186.0†	139.0†	303.0
Steel ingots and castings (including alloys)	313.0	—	1,352.0	301.0†	—	1,177.0
Rubber: Reclaimed	0.65	0.61	2.54	0.35	0.45	3.05
Natural (including latex)	—	4.80	41.1	—	3.46	43.1
Synthetic	—	0.06	0.80	—	0.05	1.63

* Distilling only. †Average of five weeks. ‡ May

Record Exports in August

EXPORTS from the United Kingdom in August (26 working days) were provisionally announced this week to have reached a total of £196.7 million. August is usually a poor export month, but this year's figures were £5.6 million higher than the previous export record of £191.1 million attained in March.

Imports were provisionally valued at £214.9 million, with re-exports at the high figure of £7.4 million. The excess of imports (valued c.i.f.) over exports and re-exports (valued f.o.b.) was £18.1 million, the lowest figure since February, 1949.

Dollar export figures were also good. U.K. exports to the U.S.A. in August totalled $30.7 million (£11 million), which was nearly as large as the record achieved in July. Exports to Canada again increased and, with a total of $34.1 million (£12.2 million), were only slightly below the May record. The combined figure of exports to North America was equivalent to $64.8 million.

METAL PRICE INCREASES

Lead Reaches New High Level

ANOTHER increase in the price of good soft pig lead by £8 from £120 to £128 a ton, delivered, was announced by the Ministry of Supply on September 9. This was the second rise by the same amount in 10 days, and brings the price higher than the peak level of £123 reached during the boom of 1948.

The cost of good ordinary brand zinc was also raised, on September 8, by £20 from £127 10s. to £147 10s. a ton, delivered. Prices of other grades varied correspondingly. Manufacturers of zinc oxides announced that prices for lots of not less than two tons (delivered buyers' premises), would be increased by £17 10s., as follows: Red seal from £119 to £136 10s.; Green seal from £120 10s. to £138; White seal £121 10s. to £139.

Wolfram ore prices were subject to a further nominal rise of 5s. on September 8, between 200s. and 210s. a unit c.i.f. European ports.

NCB Results

THE saleable output of the National Coal Board for the second quarter of 1950 was 50,083,774 tons, compared with 49,320,711 tons in the second quarter of 1949; 46,337,819 tons were "disposable commercially." The cost per ton was 45/3.6d. (45/2.2d. in 1949) and the total costs were £113,431,442. Proceeds were £120,160,413, giving a profit for the quarter of £6,728,971. After deducting interest and Profits Tax this left a surplus of £2,451,971. Total average earnings for underground workers was £9 10s. 11d. and for all workers £8 19s.

Comparison with the previous quarter reveals that proceeds of colliery operations were more than £6 million lower. The net deficiency since nationalisation has been reduced to £4,084,826.

Figures for coal production up to last week-end suggest that this year's objective of 205 to 210 million tons of deep-mined coal is unlikely to be achieved. Comparative details are:—Last week: 4,213,600 tons (deep-mined 3,976,000 tons, opencast 237,600 tons); previous week: 4,132,300 tons (deep-mined 3,924,600 tons, opencast 207,700 tons).

Galvanising Experts Visit to U.S.A.

A specialist team on galvanising left England on Thursday for a study tour of U.S.A. plants arranged by the Anglo-American Council on Productivity. They will return from New York on October 31.

NEW AFRICAN PROJECTS

Explosives for N. Rhodesia

A REPORT from Salisbury, Northern Rhodesia, states that explosives for use in the four mines of the copper belt may be manufactured there if a proposal to the Government is accepted. The creation is suggested of a £250,000 finance corporation to encourage the establishment of new industrial and commercial enterprises such as this. Imports of ammunition and explosives into Northern Rhodesia increased from £326,299 in 1945 to £629,567 in 1949, and the belief is expressed that, when local demand reaches £750,000 a year, the establishment of an explosives factory will be economically practicable. If the copper mines achieve their planned 30 per cent increase in output, this figure will be attained.

S. Africa to Expedite Coal Oil Plan

Mr. Louw, Minister for Economic Affairs, announced on September 12 that the Government would guarantee up to £13 million to finance the first company to manufacture oil from coal in South Africa. So that preparations may begin immediately the Industrial Development Corporation is being asked to make £200,000 provisionally available.

Australian Coal and Steel

BROKEN Hill Pty., Australia's largest industrial group, is spending £A3 million on the mechanisation and development of its coal mines on the south coast of New South Wales. Within the next year, almost the whole of the output is expected to be won mechanically. This will increase the industry's total colliery capacity from 3 to 4 million tons a year. The building up of the company's coal production is stated to be a major step towards the expansion of Australia's steel industry through the Port Kembla works of Australian Iron & Steel, Ltd., the principal subsidiary of Broken Hill Pty. The programme envisages an increase of 50 per cent in the steel ingot capacity of Port Kembla, and the production of more than a million tons of flat steel products annually.

Oil Survey at Southport

Southport Town Council on September 5 gave permission for immediate test borings by the Anglo-Iranian Oil Co., Ltd. for oil on Southport foreshore, between Ainsdale and Birkdale. This survey does not commit the corporation to grant rights to sink oil wells there.

CHEMICAL SALVAGE—II

Some Further Reclamation Processes

by I. BERKOVITCH, M.Sc.(Tech)., A.R.I.C.

FROM waste washing waters which contain a much lower concentration of copper and acid, the copper is recovered by passage through a bed of scrap iron yielding the copper as a metallic sludge.

Two wastes are combined to yield three useful by-products in one ingenious salvage operation used in a galvanising plant.[9] The wastes are pickle liquor from steel cleaning and zinc skimmings from the galvanising tanks. Before it is fed as slurry to a main reactor tank the zinc is all converted to the oxide. Pickle liquor is freed from dirt, then brought into reaction with the zinc oxide (in the form of slurry) and with chlorine gas. Ferrous sulphate, zinc sulphate and zinc chloride are all recovered.

Successful Metal Recovery

Ion exchange methods are recommended for use in waste treatment only where some relatively valuable material can be recovered for sale or re-use.[10] There are successful examples of metal recovery, organic compounds recovery and removal of impurities by the use of ion exchange. Copper and chromium in the wash waters from pickling copper alloy can be concentrated more than 25-fold by taking them up on this type of material and subsequently regenerating. Many processes for the recovery of precious metals have also been described.

Nicotine has been recovered from the exhaust gases of cigarette tobacco driers by scrubbing the gases with water or dilute acid and passing this nicotine through a cation exchanger of the sulphonated coal type. The nicotine is obtained by treatment of the exchanger with ammoniacal alcohol. Ion exchange may also be applied by removing undesirable impurities from a solution which is later concentrated for recovery of valuable solids. It has been used for the demineralising of waste sugar solution, the effluent afterwards being concentrated to a syrup.

Quite recently in the U.S.A. industrial alcohol has been successfully produced from fruit cannery wastes,[11] and it now appears possible that this is a practical solution of the growing waste-disposal problem of that industry. Pear waste, for instance, supplemented by the addition of small amounts of nitrogen in the form of ammonium sulphate, urea or ammonium carbonate, can be fermented continuously. In a 10-hour cycle it can produce 4.2 per cent alcohol by volume. This represents a 90 per cent efficiency in the conversion of sugar into alcohol. Apples which also require nitrogen fortification, ferment somewhat more slowly but produce a higher amount of alcohol.

In adapting industrial fermentation to cannery wastes the continuous alcoholic fermentation is carried out in a mobile unit. This gives many economies since a mobile unit is shared among canneries in different seasons. Such a unit consists of a complete distillery mounted in railway trucks with sufficient capacity to process the daily output of waste from the average cannery.

The most satisfactory continuous system is the two-fermenter one. This consists of two vessels connected in series. The first is filled with sterile medium and inoculated with yeast; then fermentation is allowed to proceed to a desired point. At this time continuous addition of fresh medium is started at a rate equal to the rate at which the yeast is growing and fermenting. At the same time the partially fermented material is continuously withdrawn from the first vessel and added to the second vessel in which fermentation is allowed to go to completion.

Cattle Feed from Cannery Waste

The unit occupies five railway trucks; one is for milling, cooking and distillation, one for fermentation, one for recovery and drying of fermentation residues, one for utilities and one for a steam generator. Unfortunately, the process is not yet fully profitable in this form. However, the residue after distillation is a high-grade yeast protein. Cattle-feeding trials are being carried out on representative samples of this by-product. Suitability of the dried residue as feed will not only solve the waste-disposal problem but its value will determine whether the process is profitable.

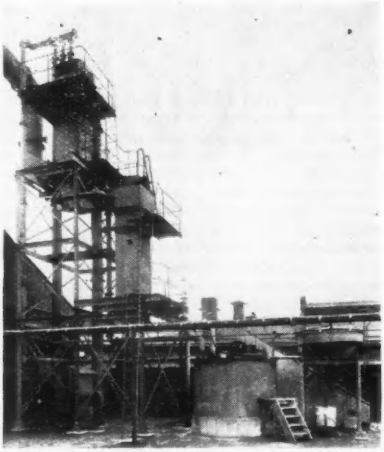
Slags produced during metal making have attracted the attention of many chemists.[12] When iron is made in a blast furnace the principal reaction is the reduc-

tion of iron ore (usually ferric oxide) by carbon monoxide produced from the coke which is simultaneously fed to the furnace. In order to remove impurities in the ore, a flux must also be added which combines with the impurities to form a liquid. The latter is the slag, which consists largely of calcium silicate but is generally very complex in composition.

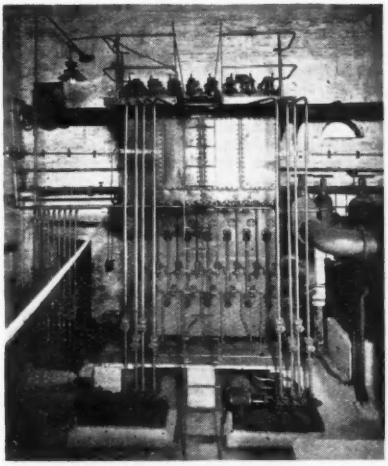
Main developments in using blast furnace slag have been in Germany and U.S.A., both of these countries being in a worse position than Britain for supplies of chalk and clay, the raw materials for Portland cement manufacture. Slag has actually been used for production of road-making materials, railway ballast, building stone, insulating materials and fertiliser.

Raw blast furnace slag may be immediately granulated by water or compressed air sprays acting on the stream of molten slag as it issues from the furnace. Alternatively, the slag may be allowed to cool either in the pot or on the dump, then crushed and ground to the fineness required. The granulated slag is suitable for blending in when making mortars, cements, building stones, breeze blocks and insulating blocks. From the slow-cooled slag, road-making materials and railway ballast may be made. Particularly in the Middle West of the U.S.A., it is added to concrete during mixing, instead of sand or ballast, as a filler. As slag wool it is used as a heat insulator.

So-called "basic slag" is used as an agricultural fertiliser. It is a product of the basic Bessemer process for steel manufacture, in which the furnace has a dolomite lining. This yields a metal quite free from phosphorus and a slag to which any original phosphorus has been transferred. This element then becomes available for soil enrichment.



Lessing process flue gas scrubber



Both pictures by courtesy of Dr. R. Lessing

Lessing process coal gas scrubber

The possibility of turning waste industrial gases into money has also stirred a certain amount of chemical interest. A large number of suggestions have been made for recovery of marketable products. Almost all gases discharged from metallurgical operations carry some material worth recovering. This may be in the form of dust produced in ore-handling or furnacing, or in the form of vapour of volatilised products. The most common filtration equipment used in metallurgical plants is the bag-filter made of some appropriate fabric, which may be cotton or wool. Such filters are economically superior to other types of collectors because of their low cost, high efficiency and relatively low power consumption. The power consumption arises because of the fans required to overcome the resistance to gas flow which the filters produce.

Next in importance is "scrubbing." Most effective of scrubbers are spray chambers with baffles which give the gas a tortuous path. The use of electrical precipitation for collecting suspended particles has also increased rapidly in recent years.

A new device applied for dust collection

is the application of ultrasonics. Essentially, dust particles are caused to oscillate or vibrate under intense sound waves at frequencies above the audible range; the particles collide violently and agglomerate. This makes them easy to remove in a cyclone or other mechanical separator. Whatever the method of separation, the recovered dust is then treated to extract metal.

A completely integrated scheme developed in Canada has recently been described.[15] Here under one management there are working a large-scale chemical fertiliser plant, a mine and a metallurgical plant. Main products are refined lead and zinc. Gold, silver, antimony, bismuth, cadmium and tin and by-products are obtained from the slimes of the electrolytic cells in which the final refining is carried out.

Recovering Sulphur Dioxide

The first step in the smelting of both the lead and zinc ore concentrates is the removal of sulphur as sulphur dioxide. Before the chemical plant was built, the gas, when released to the atmosphere, was the source of much controversy and even litigation. Eventually, legal restrictions forced the company concerned to consider suitable processes for gas recovery. The aim, of course, then became not only to extract sulphur dioxide from the stack gases, but to obtain it in such a form that it could be sold, so that the recovery plants would be at least self-supporting.

The plan developed was to recover the sulphur as sulphuric acid and so utilise it in fertiliser manufacture. This was done by organising ancillary manufacturing process, in order to turn out only saleable products. So, in addition to production of sulphuric acid from sulphur dioxide, the firm carries on synthesis of ammonia from nitrogen and hydrogen and the treatment of phosphate rock with sulphuric acid to produce phosphoric acid. With ammonia, phosphoric acid and sulphuric acid available, a balanced fertiliser production programme becomes possible. Ammonium phosphate, ammonium sulphate and ammonium nitrate form the final products of the chemical side of this integrated plant.

Elsewhere uses have been developed for " fly ash ", the residue from the burning of pulverised coal, which gets carried along long distances into the flues. Hitherto it has had to be dumped. Designers of the process hope both to solve the problem of utility undertakings in disposing of this waste and to provide abundant supplies of a cheap construction material. A mixture of limestone screenings, fly ash and a small amount of hydrated lime has been developed for use as a base course for supporting a concrete roadway and to replace the limestone screenings normally used as the base for bituminous concrete roadway.

Other fly ash applications include its use in insulating cements, building brick and in steel foundries to provide hot strength for core and moulding sand, as a replacement for silica flour. The British Electricity Authority recovers fly ash and is able to dispose of some to manufacturers of building materials, but only in amounts representing a small fraction of the quantity available.[16] From certain flue dusts—notably those from coals of the Northumberland and Durham coalfields—the rare metals germanium and gallium are being extracted. No longer just a scientific curiosity, the former metal is being used in a new range of non-vacuum electronic valves as a crystal detector.

Some of our current British problems in using or up-grading wastes prove, on further inspection, to be in fact world problems. Some of them have proved very intractable, while for others solutions have been developed but not applied. Earlier reference was made to the world danger involved in the present rate of use of sulphur. Fortunately, there are some small signs of attention being paid to its recovery.

Sulphur in Coal

Sulphur occurs as the free element in deposits in Sicily and Louisiana. More widely dispersed, it is present combined with many metals in their ores and in various forms in coal. In Britain, the three million tons of sulphur present in the annual coal output represent roughly ten times as much as is actually used for sulphuric acid production in this country. Unrecovered, it represents not only a direct loss of material, but also an important indirect loss due to the corrosive havoc it wreaks on building materials and textiles. Yet at present only about 100,000 tons of the element are recovered, and this is mainly in the course of purification of coal gas.

This sulphur is used for sulphuric acid manufacture. At Fulham power station a flue gas washing process was installed which recovered sulphur in the form of calcium sulphate dihydrate sludge, which is identical with natural gypsum. However, the sludge was not marketable except occasionally in small quantities. Also, during the war, when the authorities asked for the creation of smoke in the

London area, the process was suspended by official order and has not been reinstated.[16]

A particularly ingenious process, which was operated before the war at a Manchester gas works, combined sulphur recovery from flue gases with ammonium sulphate manufacture.[5] Calcium sulphate is prepared by a chemical route similar to that used in the Fulham process. The combustion gases are treated with a chalk suspension forming calcium sulphite, which is then oxidised to the sulphate. The latter is circulated instead of water for washing the ammonia out of coal gas. In the presence of the CO_2 also present in coal gas, ammonium sulphate and calcium carbonate are formed. The former is recovered and the latter returned to the flue gas washer. Thus the process is cyclic and continuous.

It is clear that the processes exist which can be applied at any large coal consuming plant, such as power stations, gas works, large factories and even large blocks of flats, but that they are scarcely being applied.[6]

Another British problem is that of finding a use for rubber dust. When tyres are re-treaded the old heavily loaded and aged rubber residues of the old tread are ground off. Finding an application for the resultant rubber dust has so far proved impossible. Equally intractable has been the problem of sawdust and chips. These have been considered and used for loading linoleum, for making synthetic board and (with special adaptation) for firing boilers. The Fuel Research Station (DSIR) has even published a pamphlet listing abstracts of all reported and suggested uses; but still the surplus piles up at the rate of many thousands of tons each year.

Sawmill Waste

However, there may be hope in a very recently announced Australian process. Chemical treatment of bark and sawdust mixtures of white cypress pine, *Callitris glauca*, has been effective in yielding a much more valuable product. The Australian workers report that, on treating this waste material with small quantities of para-formaldehyde at moderate temperatures and pressures, a new type of board was produced. Equal parts by weight of sawdust and ground bark were heated at 140° C., with 1 per cent of paraformaldehyde for three minutes at 180 p.s.i. The resultant board, similar in properties to many fibre boards, is considered so promising that the process is regarded as a possible solution to the problem of using Australian sawmill waste. Other commercial timber species have also given good results.

Paper mill sludge, also already referred to as a world problem, has proved equally difficult to deal with in Britain. The trouble, as old as paper-making itself, arises from the fact that the waste consists of 80-85 per cent water. The solids are 31 per cent organic and the remainder inorganic. Modern plants do not yield this refuse, but the many old plants in the country continue to add to depressing acres-wide " lakes " of this sludge.

Wax from Peat

At the Fuel Research Station attempts have been made to develop a practical process for extracting wax, by means of suitable solvents, from peat and lignite. This is strictly an up-grading process, since these materials are used at present only as low-grade fuels. Lignites occur in appreciable deposits only at Bovey Tracey (Devonshire), but there are, of course, peat moors in several parts of England and Scotland.

German lignites are reported to be yielding about 10 per cent of a crude ester wax using benzene or benzene alcohol as solvents. Benzene extraction has also been successfully carried out on the British lignites, giving a yield of 4.4 per cent on the semi-technical scale. A very similar wax has been obtained from peat, except that the melting point is a little lower and the acid value somewhat higher. Results of the experiments are still in doubt. Technically, the process presents little difficulty, but the prospect of successful competition with imported waxes is very uncertain.

Another interesting salvage possibility which has been proposed is that of recovering methane gas by anærobic digestion of alcohol distillery effluent liquors. It has been claimed[17] that by this process these effluents could be made to furnish the entire fuel requirements of stills of the vacuum type or two-thirds of the steam requirements of an ordinary two-column still.

In the sphere of extracting valuable materials from natural resources, as distinct from industrial waste, great strides have been made in seaweed research. Lord Bilsland, Chairman of the Scottish Council (Development and Industry), however, recently expressed the fear that others might be quicker than the Scots in taking advantage of this research, and this despite Britain's five years' start on every other country. Accurate figures

are not available, but the output of the British alginate and algæ producing firms is estimated to be worth about £700,000 per year. There is available each year no less than one million tons of suitable dry seaweed from the coasts of Scotland.

In considering the long-term aspect, one author has suggested[14] that all processes be assessed from the standpoint of conservation, and not only as a matter of money economics. He proposes an index called the 'conservation quotient", abbreviated to *cq* and defined by this simple equation:—

$$cq = \frac{\text{weight of replaceable or inexhaustible material}}{\text{total weight of materials used in the manufacture}}$$

It will be seen that he has included "inexhaustible" material, which evidently is meant to cover such gases as oxygen from air or salts from sea water, where for all practical purposes the sources really are inexhaustible. If this came to be applied, all suggested processes would be considered not only from the standpoint of money economics, but also of the effect on world resources. Thus, the conservation quotient of electricity made in a coal-burning power station is zero. Only irreplaceable coal has gone into its manufacture. On the other hand, the cq of electricity generated by a waterfall would be nearly one. It would be less than one only by the amount representing the wear on the equipment—the depreciation allowance, as it were.

Furthermore, increasing interest is being shown by a number of workers who are thinking of conservation, or even creation of resources, in the remarkable synthetic activity of micro-organisms.[15] For instance, a 1000 lb. bullock has been estimated to produce one pound of protein in 24 hours. A similar weight of soya bean seed yields 86 lb., and *Torulopsis* yeast gives about 4000 lb. Similarly, the marine algæ, such as the non-buoyant seaweed typified by the *Laminaria*, can produce carbohydrate (by photo-synthesis) at twice the weight per acre of the average forest.

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British Valves for Oil Industry

THE growth of British engineering's contribution to the oilfield equipment around the world is recalled in a survey by M. J. Danckwerts in the *Shell Magazine* (Vol. 30, September) of the specialised processes and plant now being employed in several progressive centres for the production of large high pressure oil valves in this country.

Recognition is paid to the rationalisation which the British Standards Institution is contributing to this relatively new industry through its Petroleum Equipment Industry Standards Committee, which for five years has been formulating specifications for valves, which have hitherto been made either to the specification of the customer, or those of the American Petroleum Institute, or a compromise between the two.

The new specifications, based on existing specifications, have been so enlarged and improved as to produce a valve thought to be as good as any before, but with a far greater degree of interchangeability. Even such details as the fit of the hand-wheel on the spindle have been taken into account; so that if the handwheel of a British Standard valve breaks a replacement from any other British Standard valve can be used. Only some of the earlier specifications have so far been published; work is going ahead with others, and in time all usual types of valve will be included.

The BPM Laboratory at Amsterdam plays a large part in controlling the quality of valves used within the Shell group; besides analysing the substance and construction of sample valves. It also undertakes long-term research into metallurgical problems encountered in the manufacture of valves. For some months past, for example, an investigation has been going on into the reasons why the 24-hour kerosine test very occasionally fails to reveal a slightly porous body.

PHENOLS FROM HYDROGENATION OILS

Success of German Methods

THE demand for phenols in Germany until about 1930 could be comfortably met by the existing plants for the production of synthetic phenol and for the removal of phenols from coal tar oil fractions. During the next decade, however, industrial demand increased to such an extent that the old sources ceased to be adequate and the development of new sources daily became more necessary.

Three processes were tried at Leuna and are described in Report No. 0008, recently issued by the Coal Tar Research Association Intelligence Section, which is a translation of a paper on this subject by Dr. Bemmann, of the Ammoniakwerk, Merseburg.

A potential source for Germany was provided by the phenol-containing waste liquids from coke plants, low temperature carbonisation plants and hydrogenation plants. The phenols from refining hydrogenated petrols also provided a rising source of materials as hydrogenation plants were extended. Yet even these new sources were not nearly sufficient to satisfy the ever-growing demand.

Synthetic Production

Germany was therefore obliged to consider an extension of the synthetic manufacture of phenol. The raw material, benzene, was not available in unlimited quantities and was urgently needed as a fuel. Moreover, no phenol homologues, like the cresols and the xylonols, are produced by this method. However, large quantities of ready-made phenols were contained in the l.t. tars, which were being produced in ever-increasing quantities, and in certain hydrogenation products. In the years before the war, therefore, efforts were made to devise suitable processes for the recovery of phenols from such oils.

The l.t. tars are not suitable for extraction in the form in which they are commercially found, since they form emulsions with the extraction liquids, which are difficult or impossible to break. The light fractions of the tars are, however, often easy to use. These fractions, with boiling points generally between 200 and 300° C., have a density and viscosity low enough to permit the rapid settling of the extraction liquids. Also, they contain the valuable low-boiling phenols in enriched proportions compared with the tar, so that, for the recovery of a given quantity of phenols, only a comparatively small amount of liquid need be worked up. This correspondingly reduces the size of the plant required.

Most l.t. carbonisation plants deliver their product to the hydrogenation works in the undistilled state in which it is collected. However, in many l.t. carbonisation plants the collection of the material itself involves a certain amount of fractional condensation of the tar. The main bulk of the material is obtained as a high-boiling thick tar, and a small portion of the total product accumulates as a middle oil-like thin tar and as a light oil. Quite often these separate products immediately re-mix together and in some cases this is only done at the hydrogenation plant.

Light Condensates

In general, no difficulties are encountered in the dephenolation of the light products before they are mixed with the thick tar. The boiling ranges of the individual fractions overlap considerably, so that the thick tar contains certain quantities of the low-boiling constituents which yield valuable phenols. However, the main bulk of the phenols is found in the light condensates in enriched proportions, so that, according to the nature of the coal, the l.t. carbonisation process used, and the conditions of condensation, about 5 to 15 per cent low-boiling phenols are obtained, together with varying amounts of higher-boiling acid oils.

Extraction Processes

The varying ratio of phenol to cresols depends mainly on the nature of the coal. For instance, most brown coal tar oils contain considerable amounts of phenol. The thin tars and light oils from l.t. carbonisation plants may often be used for the recovery of phenols by suitable extraction processes. They are easily and rapidly separated from the extraction medium, especially if they are worked up in the state in which they are collected, so that they have not been aged or brought into contact with the air. However, especially at those l.t. carbonisation plants which used old-fashioned methods, products were found which formed disagreeable emulsions with the extraction liquids and were thus unsuitable for dephenolation. Preliminary tests were

therefore necessary to ascertain whether the products of a given plant were suitable for extraction.

Apart from the l.t. tars, other potential sources of phenols were in certain oils produced by the direct hydrogenation of coal. These are formed in the liquid phase and represent an intermediate product in the production of fuel. They are only partially saturated with hydrogen, and in addition to nitrogen-and-sulphur-containing compounds, among them low-boiling phenols. To obtain useful fuels the liquid phase oils must be further hydrogenated in the vapour phase. For this purpose the liquid phase oils must first be separated into distillate and residue in a manner similar to the hydrogenation of tar oils. This distillate resembles the tar distillate so far as the content of phenols, the viscosity and the density are concerned, but for the purpose of phenol recovery it presents an even more suitable starting material.

Hydrogenation Oil

The coal liquid phase oil which has been submitted to treatment with hydrogen is considerably less contaminated with the materials interfering with extraction, such as emulsion formers and carboxylic acids. Moreover, calculated on the basis of the original phase, hydrogenation oil is a far richer source of phenols than is the tar. It has been shown that with coal, 73 times as much phenol-cresol mixture is obtained by pressure-hydrogenation as is obtained by high temperature coking. Similar, though not quite so arresting, is the relation between phenols obtained by l.t. carbonisation and hydrogenation. Direct hydrogenation of brown coal gives 10 to 20 times as much phenols as does its l.t. carbonisation. Phenols can thus be obtained from coal hydrogenation oils not only more easily, but also in considerably greater quantities than from the tars.

At Leuna an attempt was made to devise a process in which the pure acidic oils could be continuously recovered from the hydrogenation oils. It was desirable that the recovered oils should be completely soluble in dilute lyes; that is, free of neutral oils. Moreover, only the phenols were required to be extracted from the oils, which covered a fairly wide boiling range and, in addition to the valuable low-boiling phenols, also contained more or less large quantities of higher-boiling acidic compounds. Thus the extraction agent should, if possible, act selectively. The methods tried at Leuna were the hot water process, the sodium sulphide process, and the caustic soda counter-current process.

The hot water process uses as the extraction agent water at temperatures at which the solubility of the phenols is high. The subsequent separation depends on differences in solubility with temperature. The water is saturated at about 250° C. The oil-water vapour pressure relations prevailing give a working pressure of about 50 atmospheres. The most suitable quantity ratio is 2:1 of water to oil.

To make the process more economical a good heat exchange is desirable. An orifice mixer is used and other instruments are: a preheater each for oil and water; separate coolers for oil and water, and high and low temperature separators. Water is circulated continuously, and for the recovery of the phenols, use is made of the 23 gm. solubility difference between 35 gm./litre at 250° C., and 12 gm./litre at 25° C.

Before the crude extract oil may be used as phenolic oil it must undergo further treatment. First, it is topped and the higher boiling equipments are removed as residue. Its quite considerable content of neutral oil is then removed, after which it is ready for use. From the operating point of view this process has proved quite satisfactory, but it leaves much to be desired in the purity of the phenol. At 250° C. water is very much less selective than at room temperature, and its affinity for neutral oils rises far more steeply with temperature than does its affinity for phenols.

Sulphide Process

The sulphide process is based on the fact that at about 100° C. phenols will dissolve in sodium hydrosulphide lye, with evolution of H_2S, and that the phenols may later be regenerated from the solution by gassing with H_2S. Thus, phenol-containing oils are extracted in an agitator, or similar apparatus, with a solution of sodium sulphide at about 100° C., the dephenolated oil being then separated from the phenolic lye by allowing it to settle in the separating vessel. Finally, the phenolic lye is treated with H_2S at about 50° C. in packed columns, separating off the dissolved phenol in the form of crude phenolic oil. The lye regenerated by the H_2S is recycled.

The hydrogen sulphide for the process is pressurised from a gasholder into the gassing column through a blower. After passage through the towers the unabsorbed gas is united with the H_2S liberated during the extraction, and is passed back to the gas holder. Both lye and gas thus form closed systems. The only losses are due to leakage and solu-

tion of the gas and the lye in the end-products.

The crude phenol oil is practically free of neutral oil and can be separated simply by distillation. It contains considerably more low-boiling phenols than the phenol oil obtained from the same starting oil by the hot water process. This is because the weakly alkaline sodium sulphide lye selectively dissolves the more strongly acid, low boiling phenols. For instance, if in the oil to be phenolated the ratio of low-boiling phenols to high-boiling acid oils is 1:4, then in the crude phenol oil obtained this ratio will change to 1:2.

The third process is a development of the well-known method of extracting phenols from phenolic oils with caustic soda, treating the carbolate liquor thus formed with CO_2 to precipitate the dissolved phenols, and then causticising the carbonate lye with lime. The lye generated in this way is then re-circulated to the extraction stage.

The further development consists in effecting the extraction counter-current wise. It was found that, instead of using an extracting column, the process gained by being operated on a cascade-type counter-current basis. Three stages are generally sufficient. As compared with the single-stage stirring, considerable economy of lye is achieved, since the lye selectively dissolves the more strongly acid low-boiling phenols, while the more weakly acid high-boiling oils remain undissolved. The selective action of the lye is evident, even in the low boiling phenols extract, for phenol in its turn is dissolved preferentially to the cresols and the xylenols.

Evaporation Plant

This process also produces phenolic oils practically free of neutral oils, so long as the caustic soda lyes used are not stronger than 10 per cent. If the phenol oils are required to be absolutely free of neutral oils, and completely soluble in dilute lye, then an evaporation section for purifying the phenolate lye must be incorporated. Should the oil to be dephenolated contain appreciable quantities of dissolved acid gases like CO_2 and H_2S, these would require to be removed before extraction, by treatment with an inert gas.

The caustic soda stepwise, counter-current process operates under ordinary temperature and pressure. The consumption of energy is restricted to the fairly low consumption of the pumps. No corrosion problems arise. The extraction plant is not expensive, consisting mainly of thin-walled containers and ordinary centrifugal pumps. The only unsatisfactory feature of the process is the comparatively complicated and expensive regeneration of the carbolate lye by causticising with lime. It was suggested that the American proposal (Pat. App. K.147,049, Koppers Co.) to decompose the carbonate lye by electrolysis might be a better solution of this problem.

Detrimental Impurities

As regards the effect of dephenolation on the subsequent treatment of the tar oils or the hydrogenation oils, this generally consists of hydrogenation in the vapour phase over solid catalysts because any impurities in the oils, especially inorganic non-volatile materials, are detrimental. The dephenolated oils must be carefully freed of entrained lye by allowing them to settle or by centrifuging. Oils containing dissolved inorganic materials, such as alkali phenolate, must be thoroughly washed with water or redistilled.

The reduced phenol content of the oils may influence the hydrogenation itself. For example, the hydrogen requirement may be less than that of the untreated oil, since the highly unsaturated phenols are absent. The heat of the hydrogenation reaction also will be less, which in certain circumstances may be advantageous. Finally, for the action of certain hydrogenation catalysts a reduced content of phenols may be beneficial. Against these advantages must be set the fact that fuels produced from dephenolated oils have a slightly lower knock rating.

Apart from the valuable low-boiling phenols, the crude oils contain considerable quantities of water, benzene, high-boiling acid oils and, as with the oils extracted with lyes, traces of alkali. These substances are removed by distillation, water and benzene being the first runnings, and the low-boiling phenols the main fraction. The high boiling acid oils, together with the inorganic residues, remain as distillation residue. The main fraction is either used as such or divided by further distillation into phenol, cresols and xylenol mixture.

The quality of the phenols obtained from l.t. tars and from liquid phase hydrogenation oils is inferior to that of phenols obtained from h.t. coal tar, mainly on account of the comparatively high content of sulphur compounds. Their purity, however, is sufficient for many purposes.

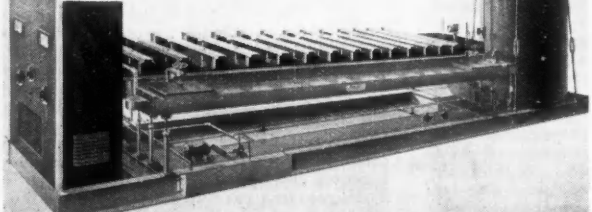
In general, the problem of the recovery of phenols from l.t. tars and liquid phase hydrogenation technically had been solved to a great extent when war broke out, though individual aspects such as the corrosion problem were not clearly defined.

U.S. Design for Small Chlorine Supplies

Economical Source of Some Essential Chemicals

THIS installation represents the U.S. solution of the problem of providing in a small compass a means of supplying principally chlorine or caustic soda wherever small quantity supplies are needed. It occupies a space of 3½ ft. by 25 ft. The unit consists of a highly developed mercury cell complete with denuder, a power rectifier, brine preparation tanks (arranged vertically), brine recirculation equipment, caustic receiving tank, etc., mounted on a single foundation.

In the unit assembly may be included auxiliary apparatus to convert the chlorine into one of several derivatives. An automatically operated absorption tower, with the addition of lime water, produces a solution of calcium hypochlorite.



By courtesy of Amroc, Inc., New York

Another alternative is a small unit to produce hydrochloric acid which uses the hydrogen, also produced by the principal plant itself, as well as the chlorine. The 24-hour output is stated to be not less than 225 lb. of 100 per cent caustic soda, 200 lb. of chlorine, and 5 lb. of hydrogen.

The production of 1000 lb. of 100 per cent caustic soda, 886 lb. of chlorine, and 25 lb. of hydrogen needs 1500 lb. of salt and about 1296 kWh.

Modernised Oil Production

THE Government of Ceylon has given a contract to the chemical plant division of Blaw-Knox and Co. of the U.S.A. to supply a fat-splitting plant to be installed in Ceylon. It will employ a continuous high pressure process and give a splitting efficiency above 98 per cent. Using no catalysts and a large measure of automatic control, it will produce fatty acids from coconut oil at the rate of 1500 lb. per hour. It will also be used to upgrade low-cost fats and greases.

The project is part of an extensive Government programme in Ceylon to modernise production of fatty oil. It will provide for solvent extraction plants, glycerin concentration, fatty acid distillation, refining and deodorising edible oils, production of mixed animal feeds, lauryl alcohol manufacture and soap production.

The price of coconut oil in the Colombo market has risen by as much as 30 per cent since the outbreak of the Korean war. Large quantities have been exported.

U.S. Aid for Italian Fertilisers

ITALY'S leading chemical combine, the Montecatini group, is reported to have applied for an ERP credit of $7.5 million to cover part of the cost of purchase, in the U.S.A., of machinery for a large new fertiliser works in Lodi, near Milan. As raw material, the plant is to utilise methane gas, which occurs abundantly in the Po Valley, to produce 180 tons of synthetic ammonia per day. Of this total, 45 tons are to be used within the plant itself for the manufacture of synthetic fertilisers, while the balance will be supplied to other fertiliser-manufacturing units for the Montecatini group. The introduction of the new process may effect a saving of 70,000 tons of coal and 150 million kWh of electric energy yearly.

Growing Total of Middle East Crude Oil

Middle East oil output, according to the Standard Oil Co. of New Jersey, has risen by 500 per cent since the end of the war and may soon exceed 2 million bbs. daily.

FLUORINE IN WOOD PRESERVATION

Report on Recent Work in Germany

THE comparatively full information which Allied intelligence reports (BIOS, etc.) have given on wood preservative preparations in Germany, has been usefully supplemented by a further report by Dr. G. Becker, of the Berlin-Dahlem Materials Testing Station (*Angew. Chem.* 1950, *62*, 382-385—21-8), dealing particularly with fluorine compounds.

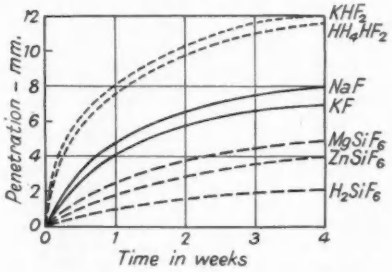
The value of fluorine and fluo-silicon compounds against various forms of mould, used either alone or more frequently in combination with other materials, is well known. Their usefulness in this respect is probably only exceeded by some mercury and thallium compounds, and in certain cases by arsenic preparations. A combination of the fluorine compounds with those of arsenic, in the so-called UA salts, is doubtless one of the most effective, especially against risk of washing out; a bichromate, and perhaps also dinitrophenol, should be included in the formula.

Reference is made in the German report to a forthcoming publication by G. Theden on this washing-out resistance of wood preservatives (*Elektrizitätswirtschaft*) now in the press. Results of tests with a large number of wood preservatives, including thallium salts, fluorides and fluosilicates, have been recently reported in the *Wiss. Abhandl. Deutsche Materialprufungsamt* (Trans. German Materials Testing Station) 1950, III, i, 40-62 and other German publications and some of this work is reviewed here.

Krieg and Pflug Method

Penetration and toxicity are among the most important characteristics to be studied. In studying penetration, it is customary, in accordance with German standard No. 52618, to employ the Krieg & Pflug (Rutgers Laboratories) method for sodium fluoride, using the zirconalizarin reaction (*ibid* pp. 84-103). This has been done for several fluoride or fluosilicate compounds, using soft pine as test wood, stored for one to four weeks in moisture-saturated atmosphere under reagent conditions showing 0.5 per cent NaF limit. Results are graphed as shown in diagram herewith.

It was evidently desirable to examine the reasons for the differences shown by the two groups, fluorides and fluo-silicates, more especially in regard to colour changes



in the Zr-alizarin reaction. Experiments with filter paper and wood showed, in fact, that a salt concentration two to five times greater than with the fluorides was required to obtain the same colour change with the individual fluo-silicates.

The Fluosilicates

It is probable that with both groups there is about the same initial penetration, but it appears less with the fluosilicates because the Zr-alizarin reaction in this case only becomes evident with greater density of protective medium. The deeper penetrations of the hydrogen fluorides can also be explained, being apparently due to more vigorous formation of HF (gaseous) than with other fluorine compounds. This was, indeed, confirmed after much experiment, including a method for determining the gas effect separately from that of the liquid.

The tests included some with very dry wood. If HF gas is within the wood it must also be escaping to the outside, as can be noted from darkening of glass or corrosion of metal at greater or less distance from the salt or treated wood. It also forces its way through air into other wood, and in sufficient concentration can be detected by the Zr-alizarin reaction. The wetter the wood the more quickly it will escape from it.

Gas penetration into wood was also investigated over twelve monthly periods. It was quicker during summer than winter, using acid or hydrogen fluoride preparations. In discussing the effect of this gas on the wood the author points out that a gas penetration corresponding to 0.5 per cent NaF—according to the Zr-alizarin

reaction — gives adequate protection against mould and insects.

From the tests made it is evident that the HF must be combined in the wood in some form, otherwise it would be difficult to explain the prolonged stability of the chemically and biologically indicated fluorine content. It has been clearly shown that destructive moulds and insects in wood can be killed with gaseous HF. This, of course, has long been known, but unfortunately the gas is dangerous to deal with. In special cases and in skilful hands it can be used to advantage either in aqueous solution or as gas.

The next point considered is the effect of fluorides and fluo-silicates in corroding iron (nails, screws, bolts, etc.) used in woodwork. Neutral or slightly alkaline fluorides are known to have no destructive effect on iron; they may in fact be protective, but the fluo-silicates, and still more markedly the hydrogen (acid) fluorides, accelerate corrosion. This is exemplified by tests made with different wood preservatives in which zinc fluo-silicate is the only constituent or the principal one, also by comparative tests in which fluo-silicates were used (Mg, Al, as well as Zn). The notable exception among the acid fluorides was that of potassium (5-20 per cent) in the so-called " screw test "; its curve nearly coincided with that of NaF.

By addition of suitable proportions of KHF_2, or of an alkaline monofluoride, the iron corrosion accelerating effect may be eliminated. Recent research at the Berlin-Dahlem station has shown, however, that only for the potassium monofluoride can this be properly claimed. It is further pointed out that the so-called Standversuch (still test) in glass vessels may lead to false conclusions.

In studying the effect of the gas evolution of fluorine wood preservatives on iron, KHF_2 may act unfavourably, and this is also true of mixtures with the NH_4 salt. It is, however, possible that the evolution of ammonia, which can be readily detected, may have some protective action against the aggressive HF acid. In any case, it is of great practical importance that some means should be found of reducing or eliminating the corrosive action of the fluo-silicates and at the same time retaining their valuable toxic properties and improving their penetrative power.

Manganese Steel Plates for Chemical Grinding

GRINDING of chemicals and other substances in ball and tube mills, of which the duration of serviceability depends largely upon the resistance of the liner material, is a familiar operation in many phases of chemical and mineral industries. Manganese steel is known to possess great toughness and under impact develops greater surface hardness. It has, therefore, in several respects been regarded as one of the most suitable materials for liner plates.

Research conducted by Edgar Allen & Co., Ltd., however, suggests that the ductility of manganese steel used for this purpose may operate unfavourably.

A current report by the company observes that under impact the working surface of the plate not only hardens but also expands laterally, and since the outer face of the plate, resting against the shell, is not subjected to hammering, distortion of the plate is liable to occur. The centre of the plate tends to lift away from the shell thus putting a big strain on the fixing bolts, which were liable to break as a result. This spreading of the manganese steel might also give rise to difficulty in the removal of worn liners, it was thought.

This disability has to some extent been overcome by metallurgical research, and a special manganese steel can now be purchased giving less tendency to warp without unduly decreasing its toughness.

Investigations were also made as to methods of decreasing the area of the plate subject to blows and at the same time increasing the intensity of the blows. These ends are said to have been achieved by a series of steps resulting finally in an improved stud liner plate. In this the hammering action of the grinding media falls on a number of stud projections forming the inner surface of the liner plate. The tops of these studs are heavily pounded, thus increasing the hardening of the manganese steel and consequently the life of the liner. Since each separate stud head can expand freely, distortion of the sole plate is avoided.

Cavities are provided in the under side of the sole plate immediately below the stud projections. These cavities have also the desirable effect of reducing somewhat the dead weight per square foot of liner plates, as compared with many other existing types of liners. At the same time the maximum thickness of metal is retained at the points of maximum wear.

The plate is covered by U.K., Indian and Pakistani and Argentine patents, and others are pending.

Technical Publications

THE British Welding Research Association has issued "Recommendations for the Standardisation of the Radiographic Examination of Welded Joints in Mild Steel Pressure Vessels" (1s. 6d.) collating the findings of a specialist committee. The latter's intention was to provide a direct practical lead towards a uniformly high standard of radiographic procedure in British industry. An important conclusion is that the interpretation of radiographs is the proper function of a person trained in radiography, and there is no justification for making the untrained engineer or inspector responsible for interpreting radiographs. His province is to assess the significance of the defects pointed out to him by the trained radiographer.

The recommendations cover plant, protection of personnel, radiographers, radiographic technique, numbering and interpretation of radiographs.

* * *

THE reprinting in booklet form of the article entitled "The Use of Wetting Agents in Fire Fighting," which originally appeared in the *FPA Journal*, lends emphasis to the findings published earlier that wetting agents may assist in suppressing heath fires but do not materially affect the action of water in other fires.

* * *

THE work of the Road Research Laboratory of the Department of Scientific and Industrial Research which was formed in 1933 to study problems in designing, building and maintaining highways, has been described in many publications. All these up to the end of 1949 are now recorded in the "Index of Publications of the Road Research Laboratory, 1933 to 1949" published for the DSIR by HMSO, price 1s. (U.S.A., 30 cents).

* * *

THE technical background and practical applications of capacitive heating—the heating of non-conductive materials by means of the dielectric losses occurring in them when they are placed in an electric alternating field—are described in one of the feature articles appearing in "Philips Technical Review."

* * *

DETAILED descriptions of the stainless steel sanitary fittings in the wide range made by the A.P.V. Co., Ltd., are contained in its latest illustrated catalogue. Listed are numerous items particularly suited to the dairy and other potable liquid industries.

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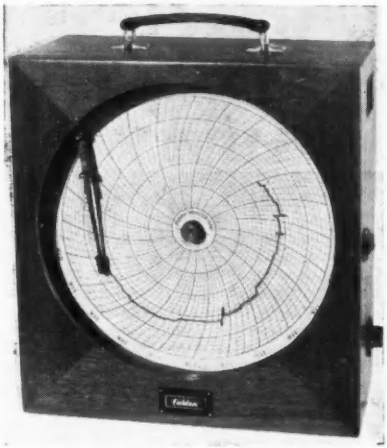


By courtesy of Fielden (Electronics), L

A portable electrical graph recorder for test room or laboratory (Model RL1) which operates on the Servograph system. It may be used in any circuit which provides enough energy to operate the equivalent indicating meter

New Measure of Standard Length

TWO American scientists, of the Westinghouse Research Laboratories and the Allegheny Observatory are using radar bombardment and atomic energy in an attempt to produce a standard accurate to one part in 40 million, on which international measurements of length can be based. The present common standard is accurate to one part in 10 million.

The basis for the new standard is the wave length of light emitted from mercury artificially made from gold in the Oak Ridge atomic pile. A microscopic quantity of mercury is placed in a capsule with argon and bombarded with ultra-short waves. The mercury vapour emits a light which is broken down into wave lengths and recorded on a photographic plate. From this the scientists are able to determine how many light waves there are per unit length.

The international standard for the metre at present in universal use is the number of wavelengths or red light emitted from the element cadmium.

OVERSEAS CHEMISTRY AND INDUSTRY

INDUSTRIAL CAPACITY IN ISRAEL

Important Expansions of Chemical Production

by H. REIK, M.Sc. (Eng.).

THE first and abiding impression of the visitor to Israel is of urgency and impatience for industrial development. Each branch of industry has many possibilities of expansion and most are hampered by the lack of foreign currency for special equipment and raw materials.

Many pharmaceutical manufacturers are acquainted with the latest developments in manufacturing techniques and eager to apply these in their own plant. The manufacturing chemist is well aware of the advantages to be obtained from the use of modern equipment such as glass plant. Some firms are in fact employing the 20 litre sizes for pilot plant-scale production, and firms in Tel Aviv and Haifa use 50 and 100 litre flasks. This equipment frequently incorporates the Isomantle type of electric heating medium, affording gratifying evidence that the British product is being sought in spite of the fact that dollars for U.S. alternatives are available. The import licensing authorities have accorded priority to electric heating mantles. These will be used in relatively large quantities; gas is not generally available for industrial use.

British Deliveries Slow

Chemical plant of a simple type is being made by local manufacturers but orders for special vessels have been placed both with British and American manufacturers. The general disadvantage that British delivery has been slow compared with that of American manufacturers seems to have been partly overcome, although enamelled vessels still are ordered in the U.S.A. when rapid delivery is required.

Considerable ingenuity has been shown in making shift with some strange equipment. This reveals the difficulties confronting the manufacturing chemist, who cannot rely on laboratory furnishers to supply within a few days any items overlooked when planning a new department, or to replace broken or damaged apparatus. The importance of glass plant has also been recognised by the authorities and facilities exist for students of chemistry at the Haifa Technical College to specialise in glassblowing. The first graduates of this course have already established a small but flourishing industry in special laboratory and some industrial glass ware.

A new factory for glass products is now being established near Petah Tiquah. This plant will be equipped with the most modern American machinery but will not produce high temperature flasks. For a long time to come Israel will have to rely on the Pyrex and Hysil type of plant and Great Britain has the opportunity to establish common standards with the American producers, whose goods have been used to a large extent.

A few firms are trying to get import licences for a stock of standard glass plant which should improve matters. Standard glass products, glass sheets, window glass etc., are being made by the Phoenicia glass works, near Haifa. This plant is now being extended. It is hoped that this work will double the capacity of the existing firms. This applies, of course, not only to the pharmaceutical but also to the general chemicals section of Israel industry.

Refining has begun again at Haifa, though only a small part of the full capacity is being used. The oil comes by tanker, from America and the Persian Gulf via the Cape of Good Hope, because Egypt will not allow Israeli imports through the Suez Canal. The by-products from the refineries will be used in the manufacture of a number of petroleum based goods. These will replace imports and thus release foreign currency for capital goods.

Ready Market for Detergents

Typical of these petroleum products will be soapless detergents. Because the use of tallow is contrary to Jewish religious principles Israel cannot take advantage of this relatively cheap by-product of the meat industry but must instead use vegetable oils as a base for natural soap. These oils are not only more expensive but also have better uses, in food and paint. A ready market exists in Israel for synthetic detergents made from petroleum bases. The use of these detergents is furthered by the fact that Israel water is hard, being 484 ppm. in Haifa and about

500 ppm. in Tel Aviv, which would result in the loss of at least 50 per cent of the soap's effectiveness.

Some—but not sufficient—synthetic detergents are already being manufactured, partly from petroleum bases and from vegetable sources. It is planned to use sulphuric acid from the contact process of the Fertiliser and Chemical Company of Haifa to produce a 40 per cent active-60 per cent sodium detergent. This will then contain a minimum of imported raw materials, and, it is hoped, be competitive in price with fat-base detergents manufactured on the Continent.

The Government is investigating the possibilities of chemical industries based on the production of primary chemicals by the use of the Catarole process, as developed by Prof. Dr. Ch. Weizmann and Dr. Bergmann in co-operation with the Manchester Oil Refineries. This process is now being pioneered in Great Britain by Petrocarbon, Ltd. It yields the complete range of aromatics from oil, as shown by the following results which are based on a typical crude oil from the Middle East.

CHARGING STOCK—IRANIAN NAPHTHA
(Percentages by weight of charge)

Gases	
Hydrogen	0.2– 0.5
Methane	14.5–16.0
Ethylene	11.5–13.5
Ethane	8.0–10.5
Propylene	11.0–13.0
Propane	2.0– 2.5
Butylenes and Butane	3.0– 5.0
Liquids	
Prebenzene	0.1– 0.5
Crude benzene	5.0– 6.5
Crude toluene	5.0– 6.5
Crude xylene	6.0– 6.5
Cr. alkyl benzene	7.5– 9.0
Cr. naphthalene oil	1.0– 2.5
Alkyl naphthalene	3.5– 5.0
Higher aromatics	1.5– 2.3
Pitch	8.0– 9.5

Publication of Wiezmann Institute of Science, Rehovoth, Israel.

The use of this process represents a long-term plan and it is hoped that a sufficient supply of crude oil would eventually allow sufficient development in the chemical field to enable Israel to become the centre of chemical industry in the Middle East.

Classes in chemical engineering are now available at the Technical College in Haifa with this development in mind. A group of its students is now on a short visit to Great Britain to study British manufacturing methods.*

Among the many new enterprises the following are of interest to the chemical industry. Pressure Lubricants, Ltd., a British firm, is erecting a re-refining plant for used lubricating oils at Lydda—near the main Israel airport. The Treasury gave permission for the export of machinery from Great Britain as investment in Israel.

* Firms willing to enable such students to visit their works are invited to communicate with the author of this article, 13, Rosemount Road, London, N.W.3.

Physical, analytical and micro-chemical laboratories at the Hebrew Technical College, Haifa

The new Mollar-Dee textile corporation is erecting a spinning and dyeing plant for American cotton which, together with the ATA textile and dyeing works (at Kurdani), will be the most modern in the Middle East.

The Assis company, the largest canning firm in Israel, is doubling its canning capacity by extending the plant to include modern American machinery.

Co-operative Enterprises

While most of the Israeli industries are private concerns it is interesting to note that a fair proportion are owned or controlled by co-operative enterprises. One of these is the contracting section of the Israel Federation of Labour (a counterpart of the TUC) which controls, among others, the Palestine Portland Cement works "Nesher" near Haifa, the Phoenicia glass works and the Vulcan foundries.

The Phoenicia ampoule factory makes over 10 million ampoules annually, while Phoenicia, Ltd., of Jerusalem, specialises in glass blowing for scientific apparatus and laboratory plant. Accumulators and batteries are produced by another factory belonging to the Israel Federation of Labour which now runs plants in every branch of industry.

There is no real chemical industry in this sector yet. It could be easily started, however, by an enterprising firm supplying the technology and machinery, while the co-operative would supply labour, buildings and materials and management.

Bauxite Prospects in Jamaica

Composition and Potentialities of Deposits

THE possible development of bauxite deposits in Jamaica, estimated to represent between 200 million and 315 million tons, is suggested in a survey of Colonial mineral resources, just published.* The report indicates that, following war time investigations of the bauxite resources of Jamaica, interest is still focused on the likelihood of developing the mineral on a commercial scale.

Jamaica bauxite is a residual product derived by weathering of the White Limestone Formation. It is a soft earthy or shaly material, uniformly porous and predominantly dark red or yellow-brown. Grey, pink, purple or black ores are rare. Dark red or reddish black pisolites, generally less than ¼ in. in diameter, occur locally but are not conspicuous. Although highly porous (the crude bauxite contains 20 per cent free moisture) and readily powdered between the fingers when dry, the bauxite is strongly coherent in place. Mixed with lime, it makes a fairly compact mortar or cement and has been much used for rough building purposes since the early days of Jamaica.

Chemical Composition

The chemical composition of the Jamaican bauxite varies both laterally and vertically in the same deposit, and from district to district, but the following range in average composition may be taken as representative of many of the large deposits:

	Per cent.
Combined water (H_2O)	26.0–27.8
Silica (SiO_2)	0.4– 3.5
Iron oxide (Fe_2O_3)	17.5–22.8
Titania (TiO_2)	2.4– 2.6
Phosphorus pentoxide (P_2O_5)	0.3– 2.8
Calcium oxide (CaO)	0.1– 1.2
Alumina (Al_2O_3)	46.4–50.3

Minor elements, totalling as oxides less than one per cent, are magnesium, vanadium, manganese, zirconium and chromium. In general, the iron content is slightly less in the yellow than in the red bauxite. The difference in colour is attributed to the state of hydration and particle size of the iron; yellow bauxite turns red when heated.

Mineralogically, the bauxite of Jamaica is composed chiefly of cryptocrystalline aluminium trihydrate, hydrated and unhydrated iron oxides and alumina-iron hydrogels. Aluminium monohydrate, possibly in the form of the mineral boehmite, sometimes occurs in appreciable amounts in the red bauxite, but is comparatively rare in the yellow bauxite. The silica is present mainly as disseminated clay minerals, the titania probably as hydrated oxides, and the phosphorus very likely as iron phosphate.

The advantages of the comparatively low silica content are unfortunately more than offset by the high percentage and physical condition of the iron oxides and the presence of phosphorus. It is believed that the state of the iron oxides is largely responsible for the poor filtration and settling characteristics which, together with the low alumina content, render Jamaican bauxite a low-grade ore. It is probably not amenable to beneficiation like most other tropical bauxites.

Although two or three small cargoes of bauxite have been shipped for experimental purposes, the mining of bauxite in Jamaica on a commercial basis has not yet been established. Recent reports, however, indicate that development may not be long delayed.

* "Colonial Geology and Mineral Resources," by H. R. Hose, M.A., F.G.S., M.A.I.M.M.E., The Quarterly Bulletin of the Colonial Geological Survey," Vol. I, 1, 1950. (HMSO 5s.)

Norwegian Aluminium Industry

THE Norwegian Government, which since the war has established a large aluminium works at Ardal, West Norway, is considering the building of a new aluminium factory further north at Sunndalsöra, near the large Aura power station now under construction. It is estimated the factory will have a capacity of 40,000 tons of aluminium a year. Norway is in a favourable position to extend her aluminium industry, having cheap and reliable all-the-year-round hydro-electric power. A Greek Government commission in Oslo recently offered to supply Norway with 40,000 tons of aluminium oxide a year.

Industrial Chemistry Conference at Milan

The 23rd Congress of Industrial Chemistry is to be held by the Société de Chimie Industrielle, in conjunction with the Società Chimica Italiana, at Milan, from September 17-23. The Congress is divided into 22 sections and over 100 papers will be presented.

GROWTH OF INDIAN INDUSTRIES

Investigations and Developments

THE State of Rajasthan has supplied 60,000 tons of gypsum since March last for the fertiliser factory at Sindri. This average supply of 450 to 500 tons a day is likely to rise to 2000 tons per day by the end of this year. Gypsum deposits occur at Jodhpur and in the Bikanir division of the State.

The fertiliser factory at Sindri will start full operations before the end of this year, and, it is estimated, the consumption of gypsum will rise to about 2000 tons per day by the end of 1951. About 1000 tons will be supplied from the Bikanir area and the remaining 1000 tons from Jodhpur, where the Government of India is now engaged in exploratory work.

An annual supply of 90,000 tons of gypsum to the cement industry of India also goes from Rajasthan. About 15,000 tons in addition are used locally for making building materials and plasters.

Eastern Chemical Fertiliser Industries

An article in the new *Quarterly Bulletin* for Asia and the Far East, published by the ECAFE, states that the two most needed materials for producing chemical fertilisers in the ECAFE region, namely, nitrogen and phosphoric acid, are produced only in India and China.

It notes the construction in India of a plant to produce 350,000 tons of sulphate of ammonia annually, and that other countries of the ECAFE region are also completing plans for establishing chemical fertiliser factories.

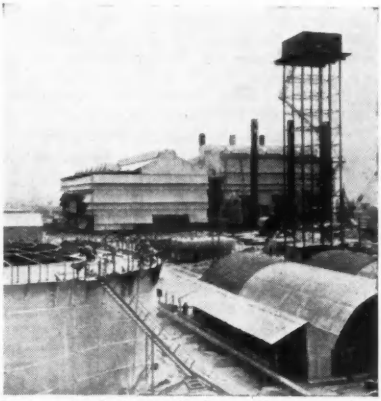
In view of the importance of chemical fertiliser manufactures, the article stresses the need for extensive geological surveys and notes that finance is the most difficult problem. It also predicts a substantial increase in the chemical fertiliser industry in ECAFE countries during 1951.

200,000 Tons of Chromite

Deposits of chromite, estimated at about 200,000 tons, are believed to exist at Naushal in the Keonjhar district of Orissa, India, according to officials of the Geological Survey of India. Chromite in India is mainly used for refractories and chemical purposes.

The Geological Survey of India undertook the investigation at the request of the Government of Orissa. The deposits occur in a one and a half mile band of rocks in the region. The nearness to the centres of the iron and steel industry and to the Calcutta port gives added importance to the deposits.

Further search for chromite and magnetite in the locality is proposed. A preliminary investigation indicated possible reserves of 500,000 tons of magnetite.



A recent photograph from the gas plant area showing the substantial proportions of the power plant installation

Camphor Proposals

Growing of tulsi plants for the manufacture of camphor is to be taken in hand in various parts of Madhya Bharat in India. Experiments carried out recently at the Forest Research Institute at Dehra Dun have shown that camphor can be manufactured from the ordinary tulsi plants. As a beginning, it is proposed to cultivate tulsi plants in the arboriculture nursery at Indore and then to distribute them to villages.

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Three factories in Madras State are now engaged in the production of power alcohol, making use of the by-products of the sugar industry, such as molasses, and using bagasse, etc., for fuel.

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The Government of India has decided to grant licences shortly for import from Aden to Calcutta of about 1 million maunds of fine salt.

• OVERSEAS •

Israel Penicillin for Rumania

A Jerusalem pharmaceutical plant is reported to have received orders from Rumania under an Israel-Rumanian barter agreement for penicillin to the value of $200,000. The fermentation material is being imported from the U.S.A.

Russian-Born Scientist Sentenced

Dr. Sidney Weinbaum, a Russian-born research engineer on a Government jet propulsion project at the California Institute of Technology until his dismissal last year, was sentenced to four years' imprisonment on September 12, convicted of swearing falsely that he had never been a member of a Communist organisation.

W. German Dismantling to End

It is officially announced that no further dismantling work is to be done in the British zone of Germany. The principal installations where demilitarisation had not be completed, but is now to stop, are the Blohm and Voss shipyards in Hamburg, the steel works building and former rolling mills at Watenstedt-Salzgitter, and the dry dock Elbe 17 at Hamburg.

Swiss Chemicals to Argentina

The Berne and Buenos Aires Governments' agreement for reciprocal trade valued at 235.8 million Swiss francs proposes that by June 30, 1951, Argentina shall import from Switzerland chemical and medicinal products valued at 31 million Swiss francs, as well as steel, machinery, motors, surgical instruments, precision instruments, and machine tools and textiles.

U.S. Developing Acrylics

The first commercial production of glacial acrylic acid, a derivative of beta-propiolactone and the basic of many synthetic chemicals, has been announced by the B. F. Goodrich Chemical Company, Cleveland, U.S.A., marking the company's entrance into the acrylic field. Manufacture will begin shortly at Goodrich's Avon Lake general chemicals plant. Although acrylic acid was first manufactured 100 years ago it has not been widely used in the U.S.A. and has been generally available only as a water solution. When it becomes available in the glacial or "dry" form, with over 97 per cent purity, it is expected to find wide usage in the plastics industry as a monomer, and in chemical industries as an intermediate for esters and other derivatives.

East German Dyestuffs

The Dyestuff Works Wolfen (Eastern Germany) is reported to have succeeded in producing dyestuff intermediates which had previously been imported from plants in the Federal German Republic. It is claimed that the fastness to light and water of the dyestuffs has been enhanced.

Deferred Action Against NHS

Chemists who were to cease to administer the National Health Scheme in Northern Ireland on September 30, as a protest against an 8 per cent deduction in payments for drugs and containers and for professional services, are to consider postponing their resignations until November 30.

Basis of Chinese Trading

State and private trading activities divide more or less equally the commercial activities of China, according to a Peking broadcast summarising the outcome of the recent conference between State trading concerns and private enterprises. It has been decided that the State should continue to monopolise certain metallic ores and bristles, limit its dealings in other major commodities, and leave the remainder to private merchants, whose scope would thus be extensive.

U.S. Molybdenum for Russia

Allegations that a United States shipment of molybdenum had been cleared by British Customs for re-export to Russia, despite its classification as a "strategic material" were made in Washington last week before a sub-committee investigating export control practices. In London, a Foreign Office representative stated that the cargo passed through British hands only for transhipment and re-export. It did not pass through the Customs or come under British control.

Austria to Fabricate Aluminium

An aluminium fabricating plant is in course of erection, with ERP aid, by the Austrian Metal Works, Ltd. (Oesterreichische Metallwerke A.G.) on the site of the Ranshofen Aluminium Works, Ranshofen. A unit for the manufacture of aluminium wire for high-tension electrical wire is already producing 18 to 20 tons per month of wire up to a diameter of 10 mm. An aluminium plate rolling mill may be completed this month. It is hoped that Austria will be able to pay for its bauxite imports by the export of fabricated aluminium.

• HOME •

Textile Conference

The Textile Institute is arranging a conference on yarn preparation, to be held at the Mechanics' Institute, Burnley, on October 26. Dyeing and preparation of yarn will be one of the principal topics.

Inquest Adjourned

The inquest on the two victims of the explosion at Monsanto chemical works, Cefn Mawr, on June 26, has been further adjourned to September 20. The men were William Ward, 39, a process worker, of Maesydre, Llanfyllin, and Richard Henry Biggs, 47, foreman process worker, of Church Street, Rhosymedre.

Unesco Order for Scottish Firm

W. B. Nicholson (Scientific Instruments), Ltd., of Glasgow, have secured and have nearly completed an order for Unesco, to supply science room equipment to schools and colleges throughout Europe. This type of work before the war was handled largely by German firms. Schools in Austria, Czechoslovakia, Poland and Bulgaria are among the countries which are receiving equipment. The firm moved in the early part of the year to a new factory at Thornliebank, near Glasgow and is developing its scale of production.

Welsh Uranium Prospects

Professor Alan Wood, of the Department of Geology at Aberystwyth, is of opinion that the uranium deposits found in North Wales are spread over a much wider area than was thought. He considers the deposit, in the black band division of beds consisting of soft, black slates, is 200 ft. thick and is not restricted to one farm or district. At present the deposit found cannot be worked successfully. The whole deposit may represent 1 million tons of rock, of which each ton would yield only about 80 gm. of uranium.

Plastics Plant Explosion

The cause of the explosion at the central laboratory at Widnes of I.C.I., Ltd. (THE CHEMICAL AGE, *63*, 237), which killed a process worker and seriously injured another, was still unknown when the inquest was resumed at Widnes on September 8. An open verdict was returned on Mr. Frederick William Gard Morrin. Mr. Herbert Lawes, plant manager, said he visited the plant before the explosion and found the mechanism working satisfactorily. Dr. John Ferguson, research director for I.C.I., said Morrin definitely was not responsible for the explosion.

Tar Oils Fire

Bootle Fire Brigade were called out on September 8 to the premises of the Lancashire Tar Distillers, Ltd., Hawthorne Road, Bootle, when a still containing 5000 gal. of light oil ignited. By strategic use of water jets the firemen had the outbreak under control in 15 minutes.

Health of Atomic Workers

Possible dangers to the health of workers on atomic projects are to be discussed at a two-day conference in London next month arranged by the Institute of Biology and the Atomic Scientists' Association with the support of the British Association.

RAF Seeks Insulating Material for Runways

Because of the damage caused by jet aircraft exhausts to concrete runways the RAF is carrying out research at Cardington to find heat-resistant materials for use on airfields. It has been found that coarse tarmacadam is the most easily destroyed, while asphalt is more durable. Asbestos cement, though resistant to jet blast, did not stand up to the effects of moving aircraft and frost. Experiments are now being carried out on stronger insulating surfaces.

Scottish Gas Chemicals

Development of large plans for plant replacement by the gas industry in Scotland promise a comparable development of chemical by-products. In Glasgow plans have been announced for a substantial expansion at Dawsholm gas works. The chemical plant at this works handles crude distilling and passes oil to Provan for refining. The adoption of carburetted water gas production may have some effect here in reducing the volume of raw materials available for chemical processing.

I.C.I. Tubes Plant

Members of Whiston Rural District Council recently inspected the 50-acre tube-making factory which I.C.I., Ltd. is building on the fringe of the East Lancashire Road, at Kirkby. Mr. H. E. Jackson, chairman of the I.C.I. Metals Division, who received the visitors, said the site had been chosen on the advice of the Government, and furthered the policy of taking work to the workers. When the factory was complete there would be no more up-to-date plant and equipment would be bigger and more powerful than any in the world used for similar purposes.

PERSONAL

PROFESSOR NEILS BOHR, of Copenhagen, is one of the delegates from abroad who attended the international conference on atomic energy at the Clarendon Laboratory, Oxford, which ended on September 13. Also at the conference, which is the first large-scale meeting of its kind to be held in Britain, was PROFESSOR P. M. S. BLACKETT, of the Manchester University. Two British women scientists, MISS M. WALTERS, Birmingham University, and PROFESSOR KATHLEEN LONSDALE, of London, also took part.

MR. J. A. CORMACK has resigned from his position as director of studies at the Technological Institute of Great Britain. He will continue to prepare condidates for technological examinations and arrange courses of instruction.

The wedding was celebrated at Claughton, Birkenhead on September 9, of MR. IAN PROUDMAN and MISS AILSA DOUGLAS MACQUEEN. Both the bride and bridegroom are graduates of the University of Liverpool, the bride having a degree of M.Sc. in biochemistry, and the bridegroom a degree of B.Sc. with honours in mathematics. He is now a research student at Trinity College, Cambridge.

The Norwegian whaling magnate, ANDERS JAHR, has given another £40,000 to the University of Oslo in addition to a previous gift of £10,000. Of the £50,000, half is earmarked for the British Institute in Oslo, £17,500 for the establishment of an institute for experimental medical research, and £7000 towards the establishment of an audiological institute.

MR. J. S. COOK, an analytical chemist of Windsor, has been selected as prospective Labour candidate for Leicester. South East. He contested the Henley Division of Oxfordshire unsuccessfully in 1945.

The gallantry of COLONEL CAMILLE SAUTERAU, one of the aviation department of the Shell organisation in France, has been recognised by the conferment by the British Ambassador in Paris of honorary membership of the Order of the British Empire. The citation recalls his courageous collaboration with Allied operations after France had been occupied, from which torture and deportation under sentence of death to Buchenwald failed to deflect him.

SIR ALAN JOHN SYKES, Bt., of South View, Cheadle, Cheshire, chairman of the Bleachers' Association, Ltd., former M.P. for the Knutsford Division, left £186,364 gross (£185,669 net; duty paid £101,270).

NEXT WEEK'S EVENTS

SUNDAY, SEPTEMBER 17

Société de Chimie Industrielle

Milan: 23rd. Congress of Industrial Chemistry. Until September 23.

Società Chimica Italiana

Milan: 6th. National Congress of Pure and Applied Chemistry. In conjunction with Societe de Chimie Industrielle. Until September 23.

MONDAY, SEPTEMBER 18

The British Engineers' Association

Brussels: 3rd. International Mechanical Engineering Congress. Until September 23.

The Institute of Metals

Bournemouth: 42nd. Annual Autumn Meeting. Until September 22.

Netherlands Physical Society

Amsterdam: International Conference on Spectroscopy at Radio Frequencies. Until September 23.

TUESDAY, SEPTEMBER 19

Incorporated Plant Engineers

Glasgow: Engineering Centre, 351 Sauchiehall Street. 7 p.m. "Training of Apprentices for Plant Maintenance" by W. Derby, A.M.I.Plant.E.

Edinburgh: 7 p.m. "Water and its Treatment" by A. E. Brown, A.M.I.Plant.E. Details of meeting place from W. Renton, 48 Broomhall Avenue, Edinburgh 12.

THURSDAY, SEPTEMBER 21

Society of Chemical Industry

London: University of London, Beveridge Hall. Plastics and Polymers Group Symposium. "Polymer Chemistry as Applied to Plastics." Until September 23.

FRIDAY, SEPTEMBER 22

Oil and Colour Chemists' Association

Liverpool: Exchange Hotel, Tithebarn Street. 6.30 p.m. Discussion meeting: "Advantages and Disadvantages of Alkyds." Three other lectures.

ASLIB

Bristol University: September 22 (evening) until September 25 (morning). Annual Conference.

Society of Leather Trades' Chemists

Leeds University: Chemistry Lecture Theatre. Annual Conference. September 22 and 23.

London BAC

The London section of the British Association of Chemists is to hold a social evening on Friday, November 10, at Williamson's Tavern, Bow Lane, E.C.4.

The Stock and Chemical Markets

A FEATURE of markets has been the expansion of business in mining and commodity shares, which were favoured as a "hedge" against the danger of inflation. Industrial shares, although firm, attracted only moderate attention. The TUC vote against wage restraint detrimentally affected some industrial shares. There has, however, been little selling, and leading industrial shares have shown firmness. In British Funds gains have been recorded. Proposals for further Colonial loan issue are anticipated.

Reports in the city indicate that many more important companies are in need of additional capital to finance development and expansion work and the higher cost of stocks, as reflected by Imperial Chemical's £20 million private placing and the Distillers Company's similar procedure for private £10 million of 3½ per cent loan stock. There will be no market dealings and no Stock Exchange quotation of either. The Distillers' stock is for a relatively short period and will be repaid in four annual instalments, starting 1956. British Celanese is among companies thought likely to raise more money before long; the annual results are due in a few weeks.

Chemical and kindred shares have shown a steady undertone this week, although Imperial Chemicals eased slightly to 41s. 9d. at which there is a yield of over 4¾ per cent on the basis of last year's 10 per cent dividend which is generally expected to be maintained. Fisons have changed hands around 26s. 9d., while Albright and Wilson 5s. ordinary units have further strengthened to 31s.

Monsanto Chemicals were 49s. 6d., Boake Roberts 30s. 3d., Laporte Chemicals 5s. units 10s. 6d., while W. J. Bush held their rise to 85s. 6d. Lawes Chemical were 10s. 6d., Amber Chemical 2s. shares 3s., Bowman Chemical 5s. 3d., and Brotherton 10s. shares firm at 20s. Pest Control were 6s. 9d., L. B. Holliday 4½ per cent preference 19s. 9d., and British Chemical and Biologicals 4 per cent preference 17s. 3d. Woolley 4¾ per cent debentures were 104½.

Borax Consolidated were again steady at 54s. 6d., British Aluminium were firm at 42s. 9d., British Oxygen higher at 96s., and Turner and Newall strengthened further to 81s. on market talk of higher dividend possibilities. United Molasses at 44s. 6d. were firm and the 4s. units of the Distillers Co. have been well maintained at 19s. following the news of the placing of the private loan. Iron and steel shares were generally well maintained, and elsewhere, Staveley moved slightly higher at 80s. 6d. Triplex Glass remained active, but at 26s. 3d. lost part of their recent sharp advance. United Glass Bottle kept firm at 75s. Boots Drug were good at 49s. 3d. Associated Cement strengthened to 83s. 9d., and in paint shares, Lewis Berger 4s. units rose to 29s. 6d. in anticipation of higher dividend. British Xylonite at 80s. were higher on balance. British Glues and Chemicals 4s. units have been well maintained at 24s. 9d., but British Match eased to 33s. 9d. Lever and Unilever at 40s. 6d. were steady on market hopes that if a big new issue of capital is planned, shareholders may be offered preferential terms of allotment. In oils sharp gains were recorded by Lobitos, Ultramar and Mexican Eagle.

Market Reports

THERE has been no apparent easing of the demand for industrial chemicals during the past week, and quotations continue to display a firm undertone. A further advance in the price of lead has brought the new basis price for dry white lead to £153 10s. per ton and for dry red lead £146 per ton. The price of copper has also been increased and copper sulphate is now quoted at £56 10s. per ton. Quotations for tartaric acid have risen by 10s. per cwt. A continued steady demand is reported for most of the soda products and the potash chemicals remain firm. Other items finding a ready outlet include the barium compounds, hydrogen peroxide, formaldehyde and bleaching powder. The general supply position remains good and the volume of shipping business in a wide range of materials is keeping up fairly well. The recent improvement in the demand for creosote oil and cresylic acid has been maintained.

MANCHESTER.—Satisfactory trading conditions have been reported in most sections of the Manchester chemical market during the past week. Inquiries from home users as well as for export account have been fairly numerous and new business has been coming forward steadily. There is, in addition, a regular flow of delivery specifications, especially for the alkali products and the potash compounds. Price changes during the week, all of which were increases, have affected chiefly the non-

(*continued at foot of page* 412)

Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages or Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

BRITISH VITAMIN PRODUCTS (HOLDINGS), LTD., London, E.C. (M., 16/9/50). Aug. 15, £50,000 deb. stock (with power to create further stock up to an aggregate of £100,000) secured by a trust deed dated Aug. 9, 1950; charged on specified shares; and a general charge.

BRITISH VITAMIN PRODUCTS, LTD., London, E.C. (M., 16/9/50). Aug. 15, charge securing deb. stock of British Vitamin Products (Holdings) Ltd., amounting to £50,000 and secured by a trust deed dated Aug. 9, 1950; charged on land and buildings at Broomfield Road, and Victoria Road, Chelmsford, with fixed plant, machinery, etc.; and a general charge (subject to etc.). *£38,000. Jan. 6, 1950.

DEXTRAN, LTD., Darlington, manufacturers of plasma substitute. (M., 16/9/50). Aug. 8, £18,500 "A" debs. and £6500 "B" debs.; general charges.

INDUSTRIAL CHEMICALS, LTD., London, W.C. (M., 16/9/50). Aug. 14, £500 debs. part of a series already registered. *Nil. July 22, 1949.

MERSEY ELECTRO-PLATING CO., LTD., Liverpool. (M., 16/9/50). Aug. 8, £1250, deb., to F. A. Whitby, Liverpool; general charge.

POWYS PAINTS, LTD. (formerly KIRBY PAINT MANUFACTURING CO., LTD.), Wrexham. (M., 16/9/50). Aug. 12, by order on terms, £1500 second deb., to G. Lomax, Rainhill; general charge. *£1828. Feb. 11, 1950.

Satisfactions

ELTHAM PAINT & VARNISH CO., LTD. (M.S., 16/9/50). Satisfaction Aug. 14, of charge registered May 21, 1947.

ESKETT LIMESTONE QUARRIES, LTD., Frizington. (M.S., 16/9/50). Satisfaction Aug. 14, of debs. registered Jan. 17, 1947, to the extent of £1000.

SOZOL (1924), LTD., London, E.C., manufacturers of chemical preparations. (M.S., 16/9/50). Satisfaction Aug. 10, of mortgage registered November 8, 1946.

Release of Receiver

T. PILKINGTON & CO., LTD., chemical manufacturers, etc., Manchester. (R.R., 16/9/50). Mr. C. H. Mellor, 337/9 Corn Exchange Buildings, Manchester 4, ceased to act as receiver on August 24, 1950.

Increase of Capital

The capital of BALDWIN CHEMICAL SALES, LTD., Harlow, Essex, has been increased by £6000 beyond the registered capital of £1000.

The capital of the CHESEBROUGH MANUFACTURING CO., LTD., has been increased from £100,000 to £200,000.

Changes of Name

The name B. & R. (Disinfectants), Ltd., has been changed to BYERS, RILEY & CO., LTD.

The name of Kerol, Ltd., has been changed to PRESSURE AEROSOLS FILLING CO., LTD.

Company News

Aspro, Ltd.

Gross trading profits for the year ended March 31 were announced at the 15th annual general meeting of Aspro, Ltd., to be £780,376, compared with £432,457 for the nine months to March 31, 1949, and £585,506 for the year ended June 30, 1948. A final dividend of 20 per cent on the ordinary stock was declared, making 35 per cent for the year.

THE STOCK AND CHEMICAL MARKETS

(*continued from page* 411)

ferrous metal products. Moderate buying interest has been reported in the fertiliser section. Most of the tar products are finding a steady outlet.

GLASGOW.—Business in the Scottish heavy chemical market has been steady and orders are for fairly large quantities. Export trading is becoming more difficult owing to greater demands for the home market and to some extent the influence upon buyers of the international situation.

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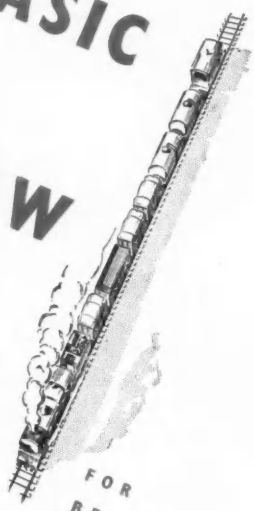

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Patent Processes in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted will be obtainable, as soon as printing arrangements permit, from the Patents Office, Southampton Buildings, London, W.C.2, at 2s. each. Higher priced photostat copies are generally available.

Complete Specifications Accepted

Method and apparatus for the manufacture of massive glass.—Sklarny A. Rafinerie Drive J. Riedel, Narodni Podnik. Aug 13 1948. 644,259.

Production of crystalline unsaturated alkyd resins and copolymerisable compositions and amorphous resins therefrom.—American Cyanamid Co. Oct. 29 1945. 644,287.

Laminated composite materials for lining walls and like purposes.—Jicwood, Ltd., B. Polovtseff, and C. H. Cook. June 25 1947. 644,563.

Normally tacky and pressure-sensitive eucohesive adhesive, and method of preparing the same, and the adhesive tape employing the adhesive. — Minnesota Mining & Manufacturing Co. July 5 1946. 644,291.

Apparatus for delivering predetermined volumes of liquid.—M. A. Lipkau. Aug. 22 1946. 644,569.

Continuous production of soap.—Oreal Soc. Anon. Oct. 21 1946. 644,358.

Stabilised organic liquids of lubricating viscosity and allied substances.—California Research Corporation. Oct. 22 1946. 644,359.

Method of cracking hydrocarbons.—Hercules Powder Co. Nov. 19 1946. 644,299.

Method for industrially obtaining metallic manganese or pure manganese dioxide.—D. Jayet. Dec. 30 1946. 644,580.

Manufacture of alkali metal chlorites starting from chlorine dioxide.—Solvay & Cie. Jan. 7 1947. 644,309.

Process and apparatus for preparing metal articles for a coating operation.—Soc. De Traitements, Applications Et Recherches Thermiques. Jan. 8 1947. 644,581.

Process of preparing an antibiotic substance.—Merck & Co., Inc. Jan. 15 1947. 644,582.

Heat-exchange device for treating oil, cream, fat emulsions, and other viscous substances.—A. V. Hammer. Jan. 15 1947. 644,312.

Coating of articles electrophoretically.—Sylvania Electric Products, Inc. Feb. 14 1947. 644,368.

Radioactive metal products and method of making the same.—United States Radium Corporation. March 15 1947. 644,585.

Recovery of nitrogen dioxide and the production thereof.—Wisconsin Alumni Research Foundation. March 21 1947. 644,371.

Process for the manufacture of melamine and the melamine resulting from said process.—A. H. Stevens. (Monsanto Chemical Co.). April 1 1947. 644,374.

Electric storage batteries.—Lat Manufacturing Co., Ltd., and G. V. Lateulere. June 12 1948. 644,380.

Electrolytic production of chlorates.—Pennsylvania Salt Manufacturing Co. May 20 1947. 644,318.

Fractionation of the components of a mixture in solution.—S. M. Partridge, R. G. Westall, and J. R. Bendall. May 31 1948. 644,382.

Manufacture of inorganic hydrous oxide gels, such as silica gels, in microspheroidal form.—American Cyanamid Co. July 4 1947. 644,322.

Textile-printing compositions.—Interchemical Corporation. July 16 1947. 644,390.

Filtering apparatus for fluids.—R. Poole. Nov. 16 1948. 644,391.

Welded joints.—Koehring Co. July 17 1947. 644,393.

Lubricating greases containing lead soaps.—N.V. De Bataafsche Petroleum Maatschappij. July 29 1947. 644,395.

Mixed esters.—Bakelite Corporation. July 29 1947. 644,597.

Non-austenitic steel.—Salle Steel Co. July 30 1947. 644,598.

Ferrous alloy.—Coast Metals, Inc. July 31 1947. 644,325.

Fluorescent material.—Sylvania Electric Products, Inc. Aug. 6 1947. 644,599.

Manufacture of oxazolidine-2, 4-dione therapeutic products.—Abbott Laboratories. Aug. 8 1947. 644,422.

Alloys.—R. D. Wassermann. Aug. 12 1947. 644,601.

Electron-ray tubes adapted for photographing electron images.—N.V. Philips' Gloeilampenfabrieken. Aug. 27 1947. 644,604.

Treatment of polythene.—E. I. Du Pont de Nemours & Co. Aug. 28 1947. 644,429.

Method of manufacturing calcium carbonate.—Ecusta Paper Corporation. Aug. 29 1947. 644,430.

Process for preparation of α-phenylacetamido-β, β-diethoxy-propionic acid.—Merck & Co., Inc. Oct. 13 1947. 644,439.

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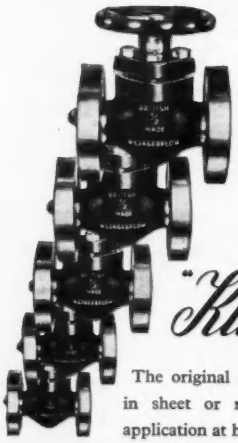

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Production of tertiary rosin alcohols.—Ridbo Laboratories, Inc. Oct. 15 1947. 644,399.

Production of useful articles from coal.—C.D. Patents, Ltd., J. G. Bennett, C. D. Greaves, and W. D. Parker. Sept. 28 1948. 644,329.

Methods of curing cement-type cold moulding compositions.—British Thomson-Houston Co. Nov. 3 1947. 644,615.

Moulding and laminating compositions.—British Industrial Plastics, Ltd. Nov. 11 1947. 644,450.

Process for the condensation of sulphonic acids.—L. Bolgar. Nov. 19 1947. 644,451.

Method of and apparatus for removing volatile solvents from materials which have been treated therewith.—Prvni Brnenksa A Kralovopolska Strojirna, Gottwaldovy Zavody, Narodni Podnik. Nov. 19 1947. 644,452.

Separation of tantalum and niobium.—Soc. Generale Metallurgique De Hoboken, and F. Cuvelliez. Nov. 21 1947. 644,454.

Preparation of organic phosphates.—American Cyanamid Co. Nov. 26 1947. 644,616.

Method of polymerisation.—Phillips Petroleum Co. Dec. 16 1947. 644,620.

Short path fractionating centrifugal stills.—Metropolitan-Vickers Electrical Co., Ltd., and G. Burrows. Dec. 14 1948. 644,621.

Apparatus for preparing a solution of blood of known blood count.—J. Kielland. Dec. 20 1947. 644,460.

Electrostatic shields for *p*H electrodes.—G. Kent, Ltd. Dec. 22 1947. 644,333.

Tubular electrodes.—Soc. Anon. Vetreria Italiana Balzaretti Modigliani. Dec. 30 1947. 644,463.

Process for case-hardening metals and their alloys.—F. J. Sowa. Dec. 31 1947. 644,465.

Ceramic insulators.—Philips Electrical, Ltd. Dec. 31 1947. 644,626.

Preparation of derivatives of phosphorous oxychloride.—I.C.I., Ltd., H. Zenftman, and A. McLean. Sept. 13 1948. 644,467.

Production of resinous polyesters.—I.C.I., Ltd., and A. McLean. Sept. 13 1948. 644,468.

Surface hardening of steel articles.—Elektriska Svetsnings-A/B. Jan. 6 1948. 644,470.

Process for manufacturing synthetic mullite.—Pilkington Bros., Ltd., and C. Jones. Jan. 4 1949. 644,471.

Production of glutamic acid.—International Minerals & Chemical Corporation. Jan. 8 1948. 644,628.

Production of diazotype photo-printing materials.—Hall, Harding, Ltd., and W. P. Leuch. Dec. 22 1948. 644,493.

Dehydration of hydroxylated fatty acid esters.—L. Berger & Sons, Ltd. Jan. 14 1948. 644,406.

Abrasive articles.—Carborundum Co. Feb. 3 1948. 644,337.

Method of and apparatus for abrasive polishing.—Doehler-Jarvis Corporation. Feb. 17 1948. 644,476.

Ionisation pressure gauge.—Department of Commerce, Director of the Office of Technical Services of. Feb. 27 1948. 644,479.

Flexible tubular structures made of thermoplastic material.—Dunlop Rubber Co., Ltd., and J. Hinton-Jones. April 21 1949. 644,516.

Manufacture of boron carbides.—F. Sivarovski. May 14 1948. 644,525.

Manufacture of steroid-17-carboxylic acids.—Ciba, Ltd. May 14 1948. 644,526.

Production of non-volatile organosilicic oils.—Soc. Des Usines Chimiques Rhone-Poulenc. May 25 1948. 644,528.

Process for vaporising sulphur for producing sulphur derivatives.—Standard Oil Development Co. June 30 1948. 644,537.

Dusting powder for plant seeds.—H. Kaserer. Aug. 9 1948. 644,543.

Electric storage batteries.—Lat Manufacturing Co., Ltd., and G. V. Lateulere. June 12 1948. 644,420.

Electrolytic capacitors.—Telegraph Condenser Co., Ltd., P. A. Sporing, and N. H. Bentley. July 26 1949. 644,560.

Production by photographic colour development of images of benzopyrazines and of benzopyrazines having fused to the pyrazine ring a benzene, naphthalene or quinoline ring system.—General Aniline & Film Corporation. Dec. 11 1946. 644,863.

Aluminium base alloy.—T. F. Bradbury. Jan. 21 1948. 644,776.

Preparation or maintenance of a liquid having a desired chemical characteristic.—Wallace & Tiernan Products, Inc. Feb. 21, 1947. 644,777.

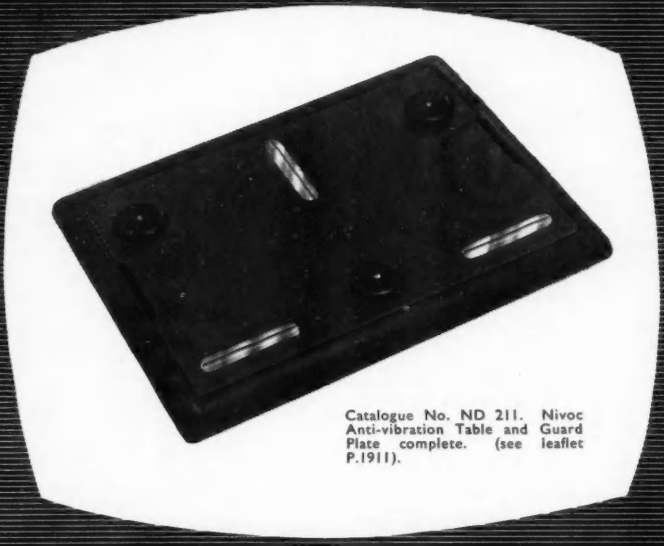
Production of finely divided metal compounds.—F. Watson. (Hoganas-Billesholms Aktiebolag). March 14, 1947. 644,781.

Process for removing coating compositions from substrata coated therewith, and the manufacture of preparations therefor.—Ciba, Ltd. April 3 1947. 644,791.

Synthetic folic acid and related compounds and the preparation thereof.—American Cyanamid Co. April 28 1947. 644,913.

Process of chlorinating acetaldehyde.—F. C. Potts (Shawinigan Chemicals, Ltd.). May 31 1947. 644,914.

THE NIVOC ANTI-VIBRATION TABLE



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CITY OF BRADFORD—SEWAGE DEPARTMENT
APPOINTMENT OF ACID PLANT SUPERINTENDENT

APPLICATIONS are invited for the position of Superintendent of the Sulphuric Acid Plant at the Bradford Corporation's Esholt Sewage Works, near Shipley, Yorks. The salary will be in accordance with Grade VIII, A.P.T. Division of the National Scale of Salaries, namely £685, rising by £25 annual increments to £760 per annum.

The appointment will be terminable at one month's notice and will be subject to the Local Government Superannuation Act, 1937 and the successful candidate will be required to pass a medical examination.

The successful candidate will have complete operational control of a sulphuric acid plant (Mills Packard chamber process), burning pyrites, and incorporating electrostatic precipitation. Acid production amounts to 9,000 tons per annum.

Candidates must have had a thorough training in industrial chemistry, preference being given to holders of a university degree or an equivalent qualification. Practical experience in the running of a sulphuric acid plant is essential.

A house, at a nominal rental, adjacent to the Acid Plant, will be available for the successful candidate.

Applications, endorsed " Acid Plant Superintendent," and giving full particulars of name, address, age, qualifications and experience, together with copies of three recent testimonials, should reach the undersigned **not later than Friday, 6th October, 1950.**

Canvassing will disqualify, and an applicant who is related to a member of, or a senior officer of the Council, must disclose the fact in his application.

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No. 204 One **WERNER PFLEIDERER MIXER OR INCORPORATOR,** similar to the above, with a C.I. built pan 25 in. by 25 in. by 19 in. deep, belt pulleys 26 in. diam. by 5 in. face, double fin-type agitators, and mounted on C.I. legs.

No. 208 One **DITTO** by **WERNER PFLEIDERER,** with a C.I. built pan or mixing chamber, of the double " U " type, 4 ft. 5 in. long by 3 ft. 8 in. by 33 in. deep, with double " Z " mixing arms, gears at each end, hand-operated tilting gear, with steel backframe, counterbalancing weights and chains, and fast and loose pulleys 3 ft. diam. by 6 in. face.

No. 209 One **HORIZONTAL " U "-SHAPED MIXER,** steel built, riveted, measuring about 8 ft. 3 in. long by 3 ft. wide by 3 ft. 3 in. deep, with horizontal shaft, fitted with bolted-on mixing arms about 18 in. long by 4 in. wide, with intermediate breakers, and driven at one end by a pair of spur gears, with countershaft, fast and loose belt pulleys, outer bearing and plug cock type outlet at the opposite end, mounted on two cradles fitted to two R.S.J. running from end to end.

No. 210 One **HORIZONTAL MIXER** as above.

No. 211 One **HORIZONTAL MIXER** as above.

These three " U "-shaped mixers are in some cases fitted with steel plate covers and a steam jacket round the bottom and extending to within about 18 in. of the top with plain end plates.

Further details and prices upon application.

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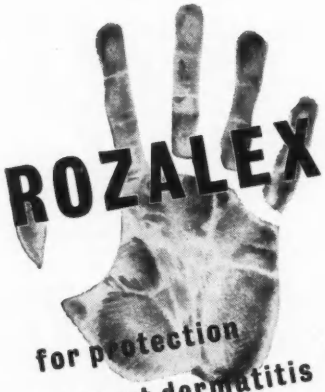

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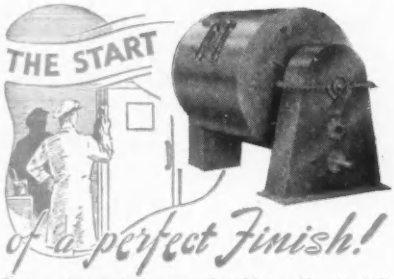

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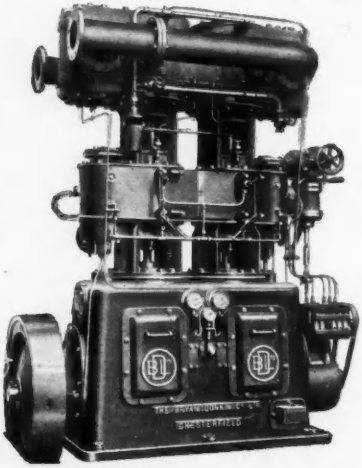

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